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ABSTRACT

A group of readings was collected to provide a background on the problems of identifying information needs. The readings are divided into four parts: General Aspects and Concepts of Information, Studies of User Information Needs, Critiques of Use and User Studies, and an epilogue. Each part contains a general introduction and a selection of readings. An appendix of survey tools and an extensive bibliography conclude the document. (WH)

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AN INTRODUCTION TO INFORMATION AND INFORMATION NEEDS: COMMENTS AND READINGS

Prepared by the

Task Force on Information and
Information Needs

Sylvia G. Faibisoff, Chairman; Donald Ely;
Gerald M. Gee; Chris De Golyer;
Arthur Grisham; Marilyn Vail-Taylor

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Center for the Study of Information and Education
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1973

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PREFACE

The study reported herein was performed in partial fulfillment of a grant from the Bureau of Libraries and Learning Resources of the United States Office of Education which led to the establishment of the Center for the Study of Information and Education with headquarters at Syracuse University, Syracuse, New York. The Center established three task forces to explore the relationship of information systems and educational systems and to engage in careful consideration of alternative uses of information: the Task Force on Information and Information Needs, the Task Force on Curriculum Reform of Library and Information Science.[1]

The Task Force on Information and Information Needs, was located at Center headquarters at Syracuse University. The staff of the Center (Sylvia G. Faibisoff, associate director of the Center; research associates Christine De Golyer, Gerald Gee, and Arthur Grisham; Marilyn Vail-Taylor, technical assistant; Director of the Center Donald Ely)began operation as this Task Force in January 1973.

The objectives of the task force were to devise a conceptual definition of information, to identify the information needs of certain groups and subgroups of the population, to review and evaluate instruments and protocols used to assess information needs and to investigate the means used to satisfy these needs. With only five months in which to accomplish these objectives, it seemed advisable to begin by summarizing and synthesizing the literature, an approach that would, we felt, produce additional results.

1. A sense of the wholeness of the field would be developed. Our aim was to profit from past accomplishments rather than to duplicate results.
2. The literature would be used by the other task forces.

3. Librarians, information scientists, researchers, educators, and those concerned with the proliferation of this literature would be alerted to the progress already made in determining needs. Future efforts would then be directed toward the clarification of previously undetermined needs.

We were extremely conscious of the magnitude of the universe we planned to explore. Limitations of time and staff precluded investigation of such matters as the economics of information, society's response to changing information needs, and the jurisdictional and legal problems blocking the transfer of information. Our study focused only on the synthesis of the literature *directly related* to information and information needs, and on the collection of significant papers, protocols and reports.

In addition to reviewing the literature, the Task Force consulted the following specialists currently engaged in studying general information needs: *Dr. Edwin Olson,* - University of Maryland - *User information needs of the poor in the city of Baltimore; Dr. Brenda Dervin,* - University of Washington - *Information needs of middle-income group; Dr. Colin Mick,* - Stanford Institute of Communications Research - *Information needs of educators; Dr. Nan Lin,* - State University of New York at Albany - *The behavioral aspects of the information user; Dr. Edwin Parker,* - Stanford University - *The communication of information; Dr. Jesse Shera,* - Case-Western Reserve University - *The problem of information transfer.*

We also discussed with *Mr. Walter Curley* and the staff of the Cleveland Public Library the potential of neighborhood information centers designed to meet the information needs of the inner city.

The composition of this report has been a collaborative effort. The staff at the Center for the Study of Information and

Education, Donald Ely, Sylvia Faibisoff, Gerald Gee and Arthur Grisham, met late in 1972 and early 1973, and discussed the advisability and desirability of creating a collection of readings that would focus on information and information needs. The need for such a work was confirmed by the Advisory Board. Later in the year, the group was joined by Christine De Golyer and Marilyn Vail-Taylor. Ms. Vail-Taylor and De Golyer merit special acknowledgement, the former for her invaluable editorial advice in addition to her secretarial competence; the latter for the footwork and yeoman service on the bibliography as well as her contributions to this report.

None of this would have been possible without the understanding, counsel, good humor and substantive contributions made by Director Donald Ely.

The Chairman is grateful to each of the contributions for whom this task was not always a primary assignment, but to which each has given time and effort beyond the call of duty.

The study of information and information needs is still in its infancy. This report is a beginning and hopefully provides some clues and insights as to what is yet to be done.

Center for the Study of
Information and Education

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FOOTNOTES: Preface

[1]Center for the Study of Information and Education, Syracuse University, *First Quarterly Report*, September, 1972, p. 1. The Task forces on Alternate Information Systems and on Curriculum Reform were located in Pacific Grove, California and Waterbury Center, Vermont respectively.

A NOTE ON FORMAT

This report, as prepared for the Bureau of Libraries and Learning Resources, contains an extensive collection of readings in support of each chapter. There are references in each essay to these readings (e.g., Article 1). The volume of the supporting materials and the fact that most of them are copyrighted prevents duplication for general distribution. However, almost all the readings are available in a good academic library. Specific citations are listed in the bibliography.

It is possible that the entire volume, including the readings, will be published in the future.

INTRODUCTION

In 1800, Goethe pointed out in his novel *The Elective Affinities*, that gone was the golden age when a young man leaving his university had learned enough to last all his life. Even at that early date, a man who wished to remain in harmony with the times had to pursue his education throughout his life. This need for continuing education and learning -- for information -- in order to remain in harmony with the times, is even stronger now than it was then.

From the Atomic Age of the forties when we began to establish the need for control, collection and dissemination of information, we have passed into the Age of Cybernetics and simultaneously into the Age of Information and Consumerism. These three related movements of the sixties and seventies are the result of advances in technology, communication and information processing. Each has brought about new problems as well as a cynical attitude regarding the ability of establishing institutions, such as schools and libraries and even the media, to satisfy the burgeoning demand for information.

Is this cynicism justified? Are our institutions failing to satisfy information needs? And, for that matter, is the population as feverishly engaged in the learning process and in a quest for information as we have been led to believe? It would appear from the volume and magnitude of recorded information, from the technological advancement in broadcasting, and from the sophisticated machinery for processing information that there is indeed a great and growing body of consumers whose needs for information must be satisfied. Equally important, we cannot be sure that we really know what kinds of information these consumers need. Alan Rees , Professor of Information Science at Case-Western Reserve University, sums it up in these words:

> The information retrieval field has been plagued for many years by busy people spending large sums of money, designing -- or attempting to design -- phantom systems for non-existant people in hypothetical situations

> with unknown needs. Needs of users are conspicuously absent in many discussions of systems design and operation. Furthermore, it is evident, in many surveys of the scientific community that a confusion exists between the wants of users and their real needs; an expressed want is often a very imperfect characterization of what is really needed -- if indeed that is known.

Rees, among others, raises basic questions about the nature of the information retrieval field, and the Task Force on Information and Information Needs was established in part to test the validity of the position that he represents. It therefore seemed advisable for the Task Force to investigate the extent to which this field had been studied and to seek answers in the literature to the following questions:

1. What is information?
2. Whose information needs have been studied?
3. What are the day-to-day information needs of the user or consumer of information?
4. Are there broad, identifiable patterns of need?
5. Have these needs been expressed? How?
6. Which protocols (survey questionnaires, interview techniques) best help to define these needs?
7. Are there adequate insights into consumer information needs to help designers create systems which will satisfy information needs?

The Task Force's goal was not the investigate information seeking behavior, nor to study library use, nor to be concerned with the success of information retrieval efforts. Its objective was to isolate information needs, to conceptualize these needs and to determine how best to

describe them. In addition, the Center aware of the declining use of libraries by the adult population as well as the non-use of libraries by minorities, examined the question of whether in the long run, any one institution, library, center or educational organization could possibly satisfy all information needs.

The literature is scattered through books and journals devoted to the physical sciences, the social sciences, engineering, library, and information sciences. Most of the studies, though ostensibly about information needs, actually concentrate on such aspects of information-seeking behavior as information use, satisfaction of needs and sources. Few actually dealt with information needs *per se*. The term, *information needs*, is, in fact, an elusive element and difficult to identify and the definition of "information" therefore seemed unattainable. Our objective was to compile a bibliography and a selection of readings which would synthesize our findings relating to these two areas.

This volume is addressed to professional persons and students in library schools, to interested information scientists and to concerned lay persons. As indicated above, we have been primarily concerned with collecting articles describing the characteristics of the groups whose information needs have been studied. We have eliminated readings, articles and bibliographic citations dealing with information seeking behavior, information seeking patterns, and sources. We have attempted to emphasize "needs, requirements, and demands." Using this delimitation, many otherwise excellent articles have been excluded since they were not "on target." This book of readings is therefore designed to give one some background research on the problems of identifying information needs.

The study is divided into four parts: *General Aspects and Concepts of Information, Studies of User Information Needs, Critiques of Use and User Studies* and *Epilogue -- Next Steps*, followed by an Appendix listing protocols, and a selected bibliography. Each part of the book is divided into units containing a general introduction by a

member of the Task Force and a selection of pertinent readings.

Part I is concerned with the problems involved in defining information, the difficulty which the user has in communicating his information needs and some general concepts of these needs. Part II identifies the disciplines and the audience whose needs have been studied, scientists, technologists, social scientists (political scientists, anthropologists, psychologists, educators, and managers) and concludes with a new direction which the study of the field is taking, namely, the investigation of the information needs of the general public. Part III of the report evaluates studies which have been undertaken and discusses shortcomings in the methodology.

Part IV indicates the necessity for a continuing study of information needs. This is as true of the areas already pursued as it is for the humanities in which little has been done. Particularly critical is the need for protocols or instruments which will specifically identify these needs. A selection of some of the more representation questionnaires successfully used has been included in the Appendix.

INFORMATION: DILEMMA OF DEFINITION

There is an old Chinese story about the Prince of Wei who asked his Master the following question:

> If the Prince of Wei were to ask you to take over the government what would you put first on your agenda?" "The one thing needed," replied the Master, "Is the definition of terms. If the terms are ill defined, statements disagree with facts, then business is mismanaged, order and harmony do not flourish. When order and harmony do not flourish, then justice becomes arbitrary and when justice becomes arbitrary, the people do not know how to move hand or foot.

We examined several hundred articles and books in an attempt to locate an encompassing definition of the term "information." Many of these describe a different aspect of the term, each relating to its own disciplinary perspective. None, however, produce a singular, comprehensive definition acceptable to all fields.

In the last three decades several disciplines (particularly psychology, communication theory, and information science) have become increasingly concerned with the manner in which humans gather, store, and communicate information. In the past, man survived by successfully applying his senses to collect, store and make use of information about his environment. Now, however, a technological environment contributes to man's inability to cope with the mass of information in which he is immersed. Certain disciplines, each with its own definition of information, attempt to solve this problem by utilizing technology to store, process and transfer vast amounts of information.

For the communication scientist dealing with the transfer of information, the term has exact, stipulative implication. C. E.

Shannon describes the term in a precise mathematical fashion; E. C. Cherry, Walter M. Carlson, and others use the designation "symbol" or "signal" to describe information. For example, Carlson says:

> *Information is a successive selection of symbols or words. In this definition all meaning is rejected as a mere subjective factor. (Article 2)*
>
> *The concept of information specifically refers to the extraction of meaning from data, signals, or symbols.*[1]

Wilson (Article 1) provides a good illustration of extrapolating meaning from symbols:

> A telegraph operator is responsive to the signals he receives as well as the numbers of words which the message conveys. He may unexpectedly become involved in the content if he receives a message not directed to him, stating that his wife is running away with another man.

While the communication scientist is involved primarily with the *technique* of transferring information, the information scientist is concerned with the *meaning* of information. No review of the literature pertaining to the meaning of information would be complete without including Anatol Rapaport's article, "What is Information?" Extensively reprinted, it is the most informative article on the relation of information to mathematical theory, technological communication theory, semantics and the information sciences. (Article 2)

Ironically, the information scientist has had great difficulty in defining just what he means by "information." In his study of thirty-nine definitions of information science, Wellisch (Article 3) found only eight definitions of information:

> All the rest couched unashamedly in circular definitions, which would be thrown out in an introductory course on logic at the undergraduate level, followed the pattern 'information science investigates information' . . . even the eight valiant definers of information . . . do not . . . arrive at an agreed-upon definition, nor do their definitions have any common element. . . .

For example:

Information is a category word, for there are many kinds of information.

> *Criticism:* To indicate that something is a category word does not reveal its components.

Information is a series of recorded marks from which information can be extracted by suitable processes.

> *Criticism:* Fairthorne "ridiculed the fact that information was thought of by some people as 'some universal essence, that can be squeezed out of a text like water from a sponge.'"

Information is the raw material and consists of a mere collection of data.

> *Criticism:* What is meant by raw material? What is a mere collection of data? What is data?

Information . . . is a process which occurs within a human mind when a problem and data useful for its solution are brought into productive union.

> *Criticism:* Wellisch criticizes this definition as "the kind of reasoning which supposes 1) that the mind of human beings is constantly occupied with solving problems and 2) that only such messages constitute information.

Information. Both in the sense in which it is used by the biologist and in the sense in which we as librarians use it is fact. It is the stimulus which we perceive through our senses. This information may be in an isolated fact or may be a whole cluster of facts: but it is still a unit: it is a unit of thought. It can have any dimension. It is that intellectual entity which we perceive as the building block of knowledge.

> *Criticism:* What is fact? Although information may be stimulative, is it a "Unit of thought"? Can it have "dimension"?

Klaus Otten and Anthony Debons, other information scientists, suggest in Article 4, in this section, that "information and operations on information" are phenomena, the principles of which provide the basis for a metascience of information (informatology). As such, they consider information to represent a fundamental and universal phenomenon similar to matter and energy. This concept is reinforced by Theodore Lowi who claims that, "information is a resource that can be used, developed, controlled or sold."[2]

> . . . As a resource, information bears a superficial similarity to energy. Fast, large, time-shared computers with universally distributed small receiving sets, bear some resemblance to large generators, distributing energy to users from big industries to small household appliances . . . information also resembles electricity in that it probably works best when distributed in large supply. That is, both are highly sensitive to economies of scale.[3]

An alternative view is presented by Peterfreund (Article 5).

Another problem in defining the term arises from its usage in both everyday language as well as in scientific parlance. For the former there has been little attempt at analysis. Information can be substantive; according to Webster's *Dictionary* information may be news, data, fact, intelligence, or knowledge. The public is not concerned that fact, data and news are not necessarily synonomous.

All that matters is that "something" has been acquired that one did not have before. Information theory treats this something as that which is the opposite of uncertainty. [4]

The interchange of the term "information" with "knowledge" is particularly provocative, and is discussed, although not definitively, by Fritz Machlup in his introduction to *Production and Distribution of Knowledge.*

KNOWLEDGE AND INFORMATION

> I propose that we get rid of the duplication 'knowledge and information.' There are those who insist on distinguishing 'information from 'knowledge,' for example, by having 'information' refer to the act or process by which knowledge (or a signal, a message) is transmitted. But even if the word is not used for the act of communicating but for the contents of the communication, one may want 'information' to refer to disconnected events or fact, and 'knowledge' to an interrelated system (though others want to confer upon 'systematic' or 'ordered' knowledge the nobler title, 'science'). One author, for example, proposes to contrast 'knowledge,' or 'contextual knowledge,' which 'illuminates the basic causal structure of some field of operation,' with 'information,' which provides current data on the variables in that field. [a] The specialist in 'information theory' uses the word, as he frankly admits, in a 'rather strange way,' in 'a special sense which . . . must not be confused at all with meaning.' To him, 'information' is a measure of your freedom of choice when you select a message .... Thus greater freedom of choice, greater uncertainty and greater information all go hand in hand. [b] This concept serves a significant purpose in an important field, but is not what is commonly meant by 'information.' Perhaps the fact that the special use of the word is becoming increasingly current should make it more desirable to use, whenever possible, the word 'knowledge' for the ordinary meaning of 'information.' *Webster's Dictionary* defines 'information' as 'knowledge communicated by others or obtained by personal study and investigation,'or alternatively as 'knowledge of a special event, situation or the like.' Hence, in these ordinary uses

> of the word, all information is knowledge. We may occasionally refer to certain kinds of knowledge as 'information,' but we shall avoid the redundant phrase 'knowledge *and* information.[5]

---

[a]The same author, however, decides later to threat both as 'information' yet he continues to oscillate between talking about 'bits of knowledge' and 'bits of information.' Anthony Downs, *An Economic Theory of Democracy*, (New York: Harper, 1957), pp. 81, 208, 215, 219.

[b]Warren Weaver,"The Mathematics of Information,"in *Automatic Control* (New York: Simon & Schuster, for *The Scientific American*, 1955), pp. 100, 104.

John J. Costello, Jr. sees data as different from information. "Data can be numerically expressed, that is quantified, quantifiable, tabular or objective . . . Data is highly repetitive. Information is not highly repetitive or quantified or quantifiable; it is characterized as narrative, subjective, qualitative, textual or descriptive. Data then, are numbers or unit facts, frequently repeated, whereas information is ideas." [6] Further analysis of the substance and semantic characteristics of the term, "information" are best expressed by J. Koblitz (Wellisch, Article 3) and by Schreider (Article 6) and Slamecka (Article 7).

For the moment, we can suggest, like Wellisch, that "any attempt at a scientifically sound statement on the nature (definition) be abandoned or . . . all those who call themselves information scientists must necessarily agree on an operational definition of information." (Article 3)Accepting this challenge, the Task Force has proposed a definition for its own operational purposes: "Information is a symbol or a series of symbols which has a potential for meaning."

FOOTNOTES: Information: Dilemma of Definition

[1]Walter M. Carlson, "Scientists' Requirements," *Electronics Information Handling*, edited by Allen Kent and Orrine Taulbee, (Washington, D.C.: Spartan Books, 1965),p.85.

[2]Theodore Lowi, "Government and Politics: Blurring of Sector Lines. Rise of New Elite -- From One Vantage Point," *Information Technology: Some Critical Implications for Decicion Makers*, (New York: The Conference Board, 1972), p. 132.

[3]Lowi, p. 136.

[4]Horace B. and Ava C. English, *A Comprehensive Dictionary of Psychological and Psycho-analytical Terms*, (New York: Longmans, Green, 1958), p. 261.

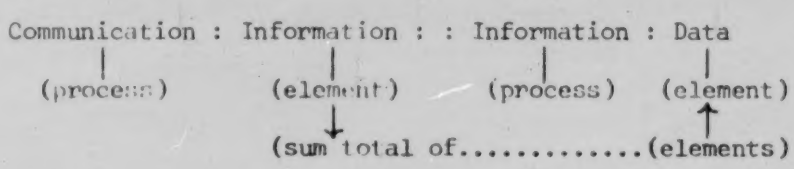
[5]Fritz Machlup, *The Production and Distribution of Knowledge in the United States*, (Princeton, New Jersey: Princeton University Press, 1962).

[6]John J. Costello, Jr., "Indexing the Depth," *Electronics Information Handling*, edited by Allen Kent and Orrine Taulbee, (Washington, D.C.: Spartan Books, 1965), p.62.

COMMUNICATION OF INFORMATION

"Information: a symbol or a series of symbols having a potential for meaning." With all of the risks and hazards present in that definition, and with some knowledge of the limitations involved, we turn to the relationship between information and communication. Communication may be operationally defined as "the transfer of meaning."

In this section we want to give attention to the communication of information, and focus specifically on several contexts and professions (librarians, scientists, educators). It seems that a tautological relationship exists between communication and information, and may be seen as the interplay between process and content. We might picture it this way:



Seen in this light, both communication *and* information take on dynamic characteristics of *process*, and the communication-information interface is established.

But what goes into this interface? How is it composed and what can it do for us? These are not simple questions, and the temptation is to seek any easy solution through the reductionistic tendencies of information science (the conservative right-side of the tautology). But the answers provided by such a quest have failed to take into account the amorphous qualities lending character and brilliance to the many-faced gem which we know simply as "information." In short, information is used daily in a variety of contexts, and, as we use it, we ourselves are shaped by it.

The extremes of our tautology are set in a systematic context by Meltzer (Article 1):

> Merely spreading data around in various formats through a multiplicity of media does not guarantee the reception and comprehension of information itself. For communication, and exchange of meaning must occur--there must be an understanding of the data.

Meltzer devotes much of his chapter to the description of a "management information briefing center" where, in the business context at least, communication of information can occur. Such a center becomes vital to the management information center.

The communication of information often seems to require the use of intermediaries in information systems. In the case of the special library, for instance, the user (librarian) and the consumer (customer) are not necessarily the same person. The librarian becomes an intermediary in the process of information-retrieval. Crum (Article 2) analyzes the ensuing librarian-customer relationship. He examines the major barriers (physical, psychological, linguistic, and contextual) in this interactive relationship in the light of Taylor's hierarchy of question-negotiation.

The communication of information occurs also in relationships which are not directly personal. These relationships (e.g. between scientific communication and mass communication or between a receiver and the information itself) present problems often resulting in particular information needs. Lin (Article 3) focuses on the differences between scientific communication and mass communication, and lists six specific suggestions to bridge the communication gap between science, technology, and the public. Lin recommends:

1) that scientists be *empathic* in their communication with the public
2) that an interpretation system be developed to "simplify" scientific information, and that the mass media be employed to disseminate this simplified or interpreted scientific information to the public

3) that *feedback* be established from the public to the scientists
4) that the tentative nature of scientific findings be emphasized in scientific communications
5) that scientific data be made available in *aggregate* form to the concerned public
6) that scientists refrain from seeking material gains or political authority

Funkhouser and Maccoby (Article 4) analyze scientific articles in terms of content and readability. They discovered that desirable reader effects such as information-gain, enjoyment, and favorable attitude are influenced by manipulating scientific texts.

Another area reflecting particular consumer information needs is the field of education. Heilprin and Goodman see an analogy between information retrieval and education based on an internal constraining influence on both (Article 5). That human constraint, the limited rates of information flow into human sense channels, has been tackled both in libraries and in schools by using a reductionist method (abstracting). The authors suggest several applications of information storage/retrieval to education in general.

The logical next step is the article by Paisley and Parker (Article 6) in which a case is made for "information retrieval as a receiver-controlled communication system."

> We consider the analogy between information retrieval and education to be strongest at the end of the educational continuum at which the largest measure of receiver control is exercised -- i.e., the upper end. It is part of our educational tradition to wean a child from dependence on source-controlled communication and to expect of him ever greater self-responsibility in his choice of communication sources, forms, and methods.

Technological advances make possible a multitude of inputs directly into the home as a local information center, but such advances also tend to isolate and further fragment an already bifurcated society.

Goldmark (Article 7) correctly reports that "in many respects the things that [are] done by communications today represent only a fraction of what could be done to improve the quality of life for everyone if communication systems were more carefully planned and if the full potential of certain technologies were exploited."

As a step in the direction of exploiting the full potential of certain technologies, using the state of Michigan as an example, Chapin (Article 8) proposes a public information corporation that would be responsible for the storage, retrieval, and dissemination of public information throughout the state. This corporation would make use of the usual library services but would also utilize computers, public broadcasting, cable systems, and other of the newer information packages. *But*, Chapin notes, "we will be able to utilize this resource only as we are able to recognize that the information needs of the citizens are more important than our traditional views as librarians, as broadcasters, as educators, and as entrepreneurs."

And, we might add, these information needs of citizens must take priority over the design and implementation of elaborate, highly sophisticated information delivery systems created to "exploit technology." Modern telecommunication systems certainly may extend the "use of urban communication" but unless these systems explicitly serve to fulfill the actual information needs of people, such technological tinkerings will not do much to improve the quality of urban life.

Theoretically, the primary purpose of information systems is to meet various information needs. But many systems (e.g. telecommunication, computer) seem to have lacked utility from the beginning because they ignored basic information needs in the interest of manipulating the overabundant data already at hand, as though the whole problem were a puzzle which merely required the rearrangement of a set of pieces.

The communication of information is at once simple and complex -- simple in the sense that it *is* reducible to specific,

definable, quantitative elements which allow for the breakdown of communication at any point in the process; complex in the sense that these elements *must* be taken together and studied in a variety of forms and contexts precisely because communication is a process.

A final article by Rogers, "The Communication of Innovation in a Complex Institution," (Article 9) is included in this section as an example of one direction that research in the communication of information may take. Rogers speaks of "open systems" which allow for "input from the external environment." He defines diffusion as "the process by which information about an innovation spreads among members of a social system," and notes that the distinct requirement of the diffusion process is time. As information (about innovations, for example) is spread among citizens in particular contexts, rudimentary information needs are discovered and new information needs are generated. The relationship between the diffusion of innovations and the communication of information deserves further attention.

CONCEPTS OF INFORMATION NEEDS

Like Diogenes, we are engaged in an exceedingly difficult mission. Our search is not for an honest man but for a precise statement of the needs peculiar to each of the diverse publics which need and seek information. The many user studies that have been undertaken identify not the needs of information users but the information-seeking behavior of such users.

Words and phrases often interfere with understanding. Such is the case with "information needs" or "user information needs." This term has become an umbrella under which a variety of studies fall; because it is a generic term, it often hides more than it reveals. If information needs can be considered as a generic concept, then there are subsets which address information demands (or requirements) and information wants (or desires). There are individuals who can articulate demands and there are those who have a desire for information but are not able to specify what it is that they "need." For example, one person may say that he needs a ride to the office while another person with the same objective may say that he needs a car. The first person has expressed a specific requirement and the second has implied a need for transportation

Brittain (Article 1) helps to chart the semantic jungle. He offers perceptive differentiations in the section of the article dealing with terminology. The definition of "information demands" is relatively easy. It refers to the demands, which may be vocal or written, and made to a library or to some other information system. The definition of "information needs" is more difficult. In some cases needs will be synonymous with demands for example, where the user knows of all the information that is relevant to his work, and makes a demand

to an information source. At the other extreme is the user who makes very few demands but has many needs. He may have a felt but unarticulated need (perhaps because of inertia or because he does not have sufficient specific details about the felt need to translate the need into a demand) or he may have an unfelt need (in which case he may not be aware until this is pointed out, at which time he may readily agree that he has a need or he may not realize this until the need has actually been met). One of the problems of exploring this aspect of user enquiry is terminological: there is no suitable word for "potential user" or "needer." While others - Menzel, Wilson and Brosin - speak to this matter, Brittain's analysis is probably the most comprehensive on the matter of specific definitions. [1] Parker's and Paisley's conclusion regarding problems of identifying information needs is also useful: "Real needs may go unexpressed if users consider them to be unrealistic (i.e., not capable of being realized by existing systems.)" [2]

Once the distinctions between demands and wants is somewhat clear and we narrow our concerns for those information demands and wants which can be articulated, we can consider the contexts in which information needs are expressed. Operational examples of three interpretations of "information needs" are presented by O'Conner (Article 2).

> *Possible Meaning 1* . . . The expression "satisfy the requester's information need" appears sometimes to be used by need theorists to mean simply: "Request negotiation good! Matching initial request bad!" For example: "Accepting a question at its face value tested only the capacity of a system to match the wording of a question and not the information need."
>
> *Possible Meaning 2* . . . "Satisfying a requester's information need" sometimes means, for need believers, giving the requester "information that will help in his work." For instance, the requester has been said to "need a set of documents which would permit him to solve his problem", or "would lead to more productive scientific research." When this meaning is not specified explicitly, it seems often to be meant implicitly.
>
> *Possible Meaning 3* . . . "Satisfying a requester's information need" appears sometimes to be understood by need believers to mean simply giving the requester . . . documents he is glad to get. . . ."

While O'Conner does not come up with specific recommendations for resolving the dilemma, his probing article pushes the information broker to consider which type of need is being requested.

What constitutes an information demand or want? Taylor (Article 3) posits four points along the question continuum: 1) an actual but unexpressed need (visceral); 2) a conscious description of the need; 3) a formal statement of the need; and 4) a question presented to the information system (compromised need). Taylor's analysis of the question-negotiation dialogue between an inquirer and an information broker is bolstered by Rees' identification (Article 4) of problems which must be resolved in satisfying information needs. While Taylor focusses on the individual involved, Rees emphasizes the potential user - library interface. Both discussions help to reveal the process of information seeking for the purpose of satisfying needs.

Other explorations of the process [Pourne (1965); Kastens (1959); Campbell (1963); Goodman and Jones (1968)] look at specific audiences, most frequently scientists and technologists. [3] From these articles the concept of information needs can be derived. Most of this writing considers information demands, not wants. We still know very little about what brings an individual to an information system or what needs may exist without every being expressed.

One basic assumption behind the discussions of information needs is that people *do* need information. Nehnevajsa (Article 5) begins at this point and further states that "The question is not whether men need information, for they do. Rather, the issue is whether the information available to them is of the right kind and quantity, of acceptable accuracy, and of appropriate timeliness." The concern for quality is just beginning to be raised in the literature. This concern seems to be central to future considerations of information needs. Nehnevajsa projects future needs in several applied fields: law, medicine, government, and education. Hayashi (1972) pursues this issue further by looking at "use value" and "esteem value" of information. Using the perspective of the future, he reviews some of the

policy issues in fulfilling wants based on human instinct and wants based on human sensibility.

In spite of the difficulty inherent in definition, the search for answers continues. Established systems are aware of the need to introduce change or lose their credibility in the community. These same systems know that effective change must respond to needs. Within the past few years public libraries, particularly in the inner cities, have been increasingly concerned with the declining use of their institutions. Charles Bourne has found that at least 70 percent of the population in the United States never uses a library and that a startling 91 percent of persons over age sixty do not use this free public service....that 85 percent of retired persons do not use the library system. [4] As a result, library budgets are declining because society does not feel that the library is meeting the needs of the public. In response to information needs, public libraries are beginning to create programs which will extend services to those subgroups of the community which have not been adequately served. [5]

In addition to the public libraries, specialized agencies are attempting to introduce change in response to user needs. For example, in 1965, the American Anthropological Association, concerned with the fact that publication patterns had not changed in fifty years, undertook a study of publication patterns and expressed strong doubts about the need to publish highly specialized articles for distribution to a group of 5,000 members, most of whom never read them. The Association hired Thomas A. Seboek and Stephen Boggs to determine alternative publication outlets for those anthropologists who were producers of information, and also to determine the real information needs of the anthropologists. Seboek and Boggs made a number of interesting discoveries, the most significant of which was the anthropologist's *need for raw data* which was not being supplied by the Association or other public channels. [6]

Unfortunately, in the past, many systems were established when there was no felt need. Several excellent computerized information

retrieval services were established-for example, Syracuse University Psychological Abstracts Retrieval Service - but went unused because they did not respond to any felt need on the part of the recipients.

In spite of failure, systems to satisfy information needs which are perceived but not necessarily supported by empirical evidence are still being created. In 1970, the Office of the Mayor of the City of New York perceived a need for "a system to provide the people of the City of New York with access to accurate and up-to-date information on the services and facilities offered by city, state and federal agencies and private non-profit organizations" [7] and therefore accumulated 10,000 items of information regarding such services and facilities. The city has promulgated information on such matters as housing, employment, health services, recreation, civil rights. Utilizing the public library as the channel for dissemination of information, the data bank of the Citizen Information Resource System (Project IRMA) will be made available and its effectiveness in meeting information needs monitored.

One of the most successful efforts in meeting the information needs of the general public was initiated by the Scenic City and Owen Sound Kiwanis Clubs of Owen Sound, Ontario, which launched a contact center to "put people in touch with the agencies or organizations best equipped to handle their questions." [8] Expanded quickly through support from Canada Manpower and Immigration's Local Initiatives Program, the Contact Center has grown, flourished, and now provides a model that other cities in North America may want to copy.

It is clear that the study of information needs is vital and that information agencies must become aware of the general patterns of information needs that have already been formalized. The following concepts have been derived from the literature:

1. *The nature and content of the information needed is variable and complex. It varies from discipline to discipline, from sub-group to sub-group. The information needed can be for a specific item or for specialized content.*

   Unfortunately, most studies have concentrated on the channels of information such as references, abstracts,

indexes, and catalogs used by information seekers and the problems associated with these, rather than studying the content of the material required. Determination of substance is an extremely difficult problem. Suzanne Prescott, who studied the substantive needs of psychologists, determined that 50 percent of her respondents were particularly anxious to acquire tapes containing dialogues between psychologists presenting differing points of view.[9]

Needs change with the times. In the pre-World War II period, political scientists concentrated on ideas, institutions, individuals and issues. After World War II, interests shifted to analysis of the media, surveys of electorates, conceptual schemes for analysis of mass opinion, voting, behavior, etc. The information scientist, the librarian or any information analyst must be constantly aware of these changing needs in order to provide the best system to satisfy these needs.

2. *Information needs are not always demanded, required or wanted in one depth.*

At times, broad, general information is needed. At other times, specific resource information is most helpful. At still other times, the individual is attempting to assimilate the information and needs feedback in order to have a means of evaluating understandings, ideas, expectations, progress, and his own self-concepts.

3. *Information needs are influenced by the type of work in which one is engaged.*

There is a distinction between the researcher and the teacher. While many are engaged in both research and teaching, priorities are usually assigned between the two. Since rewards differ for researchers and teachers, their information needs also differ. Merton and Lewis have pointed out that the intense competition to establish priority of scientific discovery has been in existence throughout the history of science. This competition for priority is a consequence of the fact that primary reward for a scientist is to have his work recognized as significant by competent fellow scientists.... Thus it should be expected that researchers in general, have greater need of information than non-researchers.[10]

Maurice Line also noted in his interviews with education lecturers and schoolteachers that their need for information was less urgent than that of the social scientists.[11]

4. *Information needs change as the various aspects of a task or problem solving are complete.*

5. *Information needs differ in substance as well as in source.*

6. *The information needs of the individual change at different stages of his career and with changes in his projects.*

7. *Information is gained throughout life. It is often perceived by one individual differently than it is by another.*

8. *Information has its highest value when there is an immediate need.*

9. *When information is needed, it must be TIMELY, ACCESSIBLE, and REVEVANT.*

The literature is replete with studies emphasizing these three elements of information need.

The articulation of information science programs is based on the thesis that there is a *need* for access to recorded knowledge that must be satisfied by providing rapidly, conveniently, economically, and with precision, that portion of the current or previous literature that will be useful

--to a particular individual
--at a particular time
--for a particular problem or interest
--and in a form that is useful to him
regardless of:
--where it was generated
--in what form or language
--and in a form that is useful to him.

The utopian dream is to have information available on the day of publication, neatly packaged in quanta which are of infinitely variable size and content. [12]

Diana Amsden's study of the needs of anthropologists revealed that 56 out of her 76 respondents often used periodicals which were less than one year old; then 47 of the 76 used literature one to five years old; 28 used or needed periodicals 5-10 years old and only 24 needed literature over 10 years old. [13]

Timeliness is a need expressed by many of the segments of society whose information needs have been studied; for instance, businessmen, scientists, anthropologists, political scientists. Timeliness not only characterizes the age of the literature which is needed, but the length of time needed to retrieve information. The effects of delay may be measurable in dollars and cents.

In many situations there is an overabundance of literature. For instance, Congressmen have quite enough

information "in the form of bills, reports, speeches, testimony, regulations, decisions . . . Congressmen are swamped with documents produced by Congress itself, and they are deluged with publications of executive agencies. On one hand, not all of this information is needed by Congress, while on the other hand Congress still needs much information which it does not get.... Congress' problem is one of obtaining relevant information. What Congress really *requires* is a procedure for *acquiring the information it needs* and a method for processing that information in order to learn *what it wants to know.*[14]

On the other side of the coin, Weick and Klare in a chapter in *People and Information* find that "despite the growth of available information, which at first glance suggests overload rather than insight, individuals, in their everyday doing of science, develop practicable (and for them functional) rules for searching and selecting the relevant and avoiding the peripheral. How many of our protestations about overload have then been gloss rather than reflection of actuality?[15]

10. *An inverse ratio frequently exists between the quantity of information and its quality.*

    Redundancy, error in fact, lack of substance may indeed set in with larger quantities of information.

11. *Different classifications of persons use different sources of information.*

    The ranking of major information needs is dependent upon such individual differences as age, race, level of education, financial situation, hierarchical status in the community or organization with which they are affiliated, geographic environment.

12. *There are many publics using information.*

13. *Most people are not active information seekers.*

14. *The search for information is not necessarily undertaken with the idea of maximum return, but according to the philosophy of least effort.*

15. *Information for "nitty-gritty" decisions are abysmally low, and the information systems which have been made available to help people answer such questions are grossly inadequate.*

16. *There is a need for information exchange.*

17. *Need for a new type of information specialist:*

    Diana Amsden concluded from her study that a "new kind of scholar, is needed in the field of anthropology: one who devotes himself to communication among the

researchers and teachers in his field by the writing of synthesizing and evaluative bibliographical essays."[16]

18. *Information needs can be stimulated simply by the knowledge of what facilities and/or materials are available.*[17]

FOOTNOTES: Concepts of Information Needs

[1]Herbert Menzel, "Information Needs and Uses in Science and Technology," *Annual Review of Information Science and Technology*, I (Chicago: Encyclopedia Britannica, 1966), p. 41-49; Ira G. and Marthan A. Wilson, "An Elementary Description of Some Information Concepts," *Information, Computers and System Design*, (New York: John Wiley & Sons, 1966), pp. 21-28; Henry W. Brosin, "Expressed and Unexpressed Needs," *Electronic Information Handling*, edited by Allen Kent and Orrine Taulbee (Washington, D.C.: Spartan Books, 1965), pp. 75-83.

[2]William J. Paisley and Edwin G. Parker, "Information Retrieval as a Receiver-Controlled Communication System," *Education for Information Science* (Washington, D.C.: Spartan Books, 1965).

[3]Charles P. Bourne, "Review of the Methodology," *Information Systems Workshop* (Washington, D.C.: Spartan Books, 1962); Merritt L. Kastens, "Information Needs of Applied Research," *Modern Trends in Documentation*, edited by Martha Boaz (New York: Pergamon Press, 1959), pp. 23-30; Wayne R. Campbell, "Feedback from the User - *sine qua non* -," *Information Handling: First Principles*, edited by Paul W. Howerton (Washington, D.C.: Spartan Books, 1963); Arnold F. Goodman and S. O. Jones, *User Information Needs: The Challenge and a Response* (New York: Greenwood Publishing Corp., 1968).

[4]Charles P. Bourne, Victor Rosenburg, Marcia J. Bates and Gilda R. Perolman, *Preliminary Investigation of Present and Potential Library and Information Service Needs* (Berkeley: University of California, Institute of Library Research, 1973).

[5]See chapter on "Information Needs of the General Public."

[6]Stephen T. Boggs, "Information Problems in the Field of Anthropology," *Proceedings of the 1965 Congress*, International Federation for Documentation (Washington, D.C.: Spartan Books, 1966), pp.175-178.

FOOTNOTES: Concepts of Information Needs (cont'd)

[7]Personal communication to Donald Ely, September 13, 1972.

[8]"The Contact Centre," *Library Journal*, XCVII (December 15, 1972), 3955-3959.

[9]Suzanne Prescott and Belver C. Griffith, *A Descriptive Study of Information Needs and Practices of Clinical Psychologists* (Washington, D.C.: American Psychological Association, 1970).

[10]John Michael Brittain, "Studies in the Social Sciences," *Information and its Users, A Review with Special Reference to the Social Sciences* (Bath, England: Bath University Press, 1970), pp. 34-120.

[11]Maurice B. Line, "The Information Uses and Needs of Social Scientists: an overview of INFROSS, *Aslib Proceedings*, XXIII:8 (August, 1971), pp. 412-435.

[12]Allen Kent, "Information Science: Media Implications of the New Means of Information Organization," *To Improve Learning*, edited by Sidney G. Tickton, Vol. I (New York: Bowker, 1970), p. 287.

[13]Diana Amsden, "Information Problems of Anthropologists," *College and Research Libraries*, XXIX (March, 1968), 117-131.

[14]Kenneth Janda, *Information Retrieval; Applications to Political Science* (Indianapolis, Indiana: Bobbs-Merrill Co., Inc., 1968), p. 194.

[15]Cited in James A. Robinson, "Some Leaves for a Political Scientist's Notebook," *People and Information*, edited by Harold B. Pepinsky (New York: Pergamon Press, 1970), p. 302.

[16]Amsden, pp. 125-6.

FOOTNOTES: Concepts of Information Needs (cont'd)

[17]Nan Lin and William D. Garvey, "Information Needs and Uses," *Annual Review of Information Science and Technology*, VII (Chicago: Encyclopedia Britannica, 1972), 5-37.

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INFORMATION NEEDS OF SCIENTISTS AND TECHNOLOGISTS

I. General Information Needs

Most scientific information is highly specialized and is recorded in a language that only a few highly trained people can understand. [1] Only a few researchers may be interested in a certain unit of information, but they create from that unit a technology or philosophy that may affect everyone's life.

Although everyone uses some scientific information, only fundamental and applied researchers generate new information by experiment, while relying heavily on existing data to produce new material. Since the body of scientific knowledge is enormous, the probability of the essential bit of information getting to the appropriate researcher is low without the help of a well-designed system. Scientific researchers were the first group to feel the effects of the information explosion and to demand better retrieval systems. For this reason, user studies have concentrated on researchers more than on any other group.

Section I of the articles below, identifies the different groups using scientific information, and summarizes known needs. Section II considers only scientific researchers: what information they need, how much, and their suggestions for better service.

Bernal (Article 1) identifies seven categories of users of scientific information: 1) fundamental scientific researchers; 2) applied scientific researchers and developers (agricultural, engineering and medical); 3) technologists (agricultural and medical practioners, architects, engineers [2]); 4) teachers, students, report writers; 5) scientific and technical journalists; 6) the interested public; 7) historians of science. A person belongs to one or more of these categories according to his use of scientific information. For instance, a professor belongs in category four when he is teaching

a class and in category 1 when he is doing research.

Bernal makes the following observations about each group:

> Fundamental scientific researchers (category 1) represent 5 percent of all users and 20 percent of the total use of scientific information. Applied scientific researchers and developers (category 2) are far more numerous and use more information than any other group.
>
> Technologists (category 3) need less information than researchers, but the information they need is not easily available.
>
> The special requirements of teachers, students and report writers (category 4), all of whom need thorough coverage of a particular field, subjects information sources to serious and probably salutary strain.
>
> Journalists and the public (category 5 and 6) need "more personal attention than mechanical retrieving services can provide." (Auger, Article 2, adds that scientific literature for the public must be simplified: " . . . the substance of the problem is not so much to make people absorb the whole mass of basic scientific knowledge as to make them understand . . . the very nature of science.)
>
> Historians of science (category 7) do not have an information problem, because "retrieval of information is part of their professional skill." far more information is available to them than they need or want.

II. The Scientific Researcher's Information Needs

A. The kind of information needed

The scientist's need for information is obvious but the kind of information needed seems to vary with every scientist and every research project. For instance, the projects of fundamental scientific researchers are usually subject-oriented, covering several subject areas. The fundamental researcher seeks information within a specific subject area; applied researchers must gather information from several areas in order to solve the problem.[3]

A few studies have tried to determine the subject areas wherein most information needs fall, but the results are applicable only to the population studied, and are not general enough to construct an overview of what subject areas cause the most problems for information seekers.[4] The studies have shown, however, that each researcher has the greatest problem getting information in subjects outside of his own discipline. Since he is not acquainted with the information sources in other subjects, he depends on formal systems to satisfy his information need.

Some studies have divided the total amount of information into two categories -- technical and non-technical. The Department of Defense (DOD) Study (Article 3) on the information needs of researchers and developers determined that 75 percent of all information sought was technical in nature. There are three types of technical information: data, theories, and procedural information. In the DOD study, data accounted for 41 percent of the total information used. Hanson's survey of user studies (Article 4) determined that 20 percent of the demand is for data. Both surveys agree that 25 to 33 percent of the demand is for procedural information; theories represent only 8 percent of the total.

Each of the three types of technical information has a unique mode of transmission. Data is the most easily transferred form of information but it must be current, complete and accurate.

Procedures and techniques are communicated best through live demonstration; theories through original papers or informal communication (the main problem being dissemination).[5]

B. The amount of information needed

An assumption underlying the design of information delivery systems is that the more information the scientist absorbs, the more he can produce, but Kurt Back studied the conditions related to optimal productivity of the researchers, and concluded that there is "not a direct relationship between the amount of information he receives and his potential contribution." He suggests that too much information stifles the scientist's curiosity and reduces his productivity.[6] Bernal points out that the absence of information and the gaps in knowledge are "often the most fruitful impetus to new work."

The DOD study and a study of researchers in the McDonnel-Douglas Aircraft Corporation tried to measure how much information scientists want, as based on their stated demands. These two studies agree that researchers require only one relevant document 30 percent of the time; several documents 20-25 percent of the time; all information available on a subject 20-40 percent of the time.[7]

C. The need for better systems

Although it would be ideal to isolate scientists' needs, some of their needs do not become apparent until, by trial and error, they interact with a system to fulfill these needs. Problems arise from interaction with a system that cannot fulfill the needs. It is worthwhile to study the problems of fruitless interaction and to infer information needs from them.

Scientists are in a unique position because they are equipped to generate much of the information they need. Most of their concern lies with obtaining existing information more easily than is now possible. A general problem with information systems is the difficulty of predicting when, where, and how much information will be produced.

Menzel (Article 5) notes that three untested assumptions have consistently shaped the design of information systems: 1) a system must provide information quickly and efficiently; 2) it must supply all relevant documents; and 3) automation and systemization of information processing and dissemination are essential. These assumptions should be tested.

In order to create effective information systems, a number of studies indicate that the following needs must be met:

1. The need for more *prompt* dissemination of information. Several user studies have determined that the greatest information problem today is the time lag between the production and dissemination of information.

2. The need for *quality filtering* of information. All information should be screened for accuracy, relevancy, and quality before it enters an information system. This would lessen the effects of the information explosion.

3. The need for the *right amount* of information at the *right time.*

4. The need for receiving information in the *desired form,* usually oral or written, and in *understandable language.*

5. The need for *active, selective switching* of information. The ideal would be to receive the right information without having to ask for it.

6. The need to *browse.* Perusal of peripheral documents allows scientists to fulfill, through serendipity, needs that they have not yet formulated.

7. The need to get information *easily* and *inexpensively.*

8. The need for awareness *of current literature,* and the need to know of *work in progress.*

9. The need *to know about* and *how to use* available information systems.

10. The need for *syntheses* of the literature, state-of-the-art *reviews,* and introductory *surveys* of subjects.

11. The need to *expedite interpersonal communication.* If informal communication is considered a kind of information system, many of its characteristics are included in the above list. As a part of this system, each scientist reads documents, stores bits relevant to himself and others, and disseminates these relevant bits rather than transferring the whole document. He also translates the information into terms that his colleagues understand. He saves information and selectively disperses it to those he knows want it. Unpublished and unpublishable information is also transmitted through interpersonal communication (Menzel, Article 6). One scientist said that "he had never found that anyone failed to get the information he wanted, provided he *knew the right* person to ask!" [9] The informal communication system is convenient and easy to use. However, it is only as reliable as the people involved. It is not systematic, cannot possibly be complete in itself, and must be combined with formal systems.

12. The need for a knowledgeable *person* to guide the scientist to information in fields outside of his own field of study. Scientists have expressed the need for dialogue, which helps the scientist to "personally explain, clarify, and modify his requirements." [9] Only a person more knowledgeable than the inquirer can help clarify the question. Since many of the inquirer's demands for information are in a field different from his own it is especially important for the intermediary to have specialized knowledge.

Although the above requirements are not easily met, they are guidelines for the development of future information systems.

III. Information Needs of Engineers

In user studies prior to 1965 few studies distinguished between the information needs of engineers and scientists. In the mid 1960's, Price (Article 1), and Marquis and Allen (Article 2) point out that engineers' needs and sources of information are quite different from those of scientists, and should be studied separately. The scientists' main goal seems to be to generate and publish new information, while the engineers' goal is to develop and improve a product or process. Publication is a secondary concern for the engineer; instead, new information may be kept in-house or it may be patented and sold. Unfortunately, much information of value to other engineers never appears in the professional literature, and when it does it may be in such specialized language that they cannot understand it. The engineer often wants information that exists in another organization's documents, but is unpublished and is not distributed by the other organization. Scientific literature is generally of little use to the engineer since natural scientists write primarily for other scientists. The scientific and technological research fronts are concerned about different subjects; very few common interest exist between the two (Marquis and Allen).

Most engineers work in mission-oriented government or private industry. For reasons of security or profit, communication between these organizations is limited. Communication between organizations is also made difficult by the communication systems peculiar to each company. [10] Few invisible colleges exist in engineering as they do in science. Internal reports and co-workers in the engineer's own organization are his most available sources of knowledge.

Just as there are differences in needs between engineers and scientists, there is considerable variation in needs among most engineers. Needs vary according to occupation and specialty. Rosenbloom and Wolek [11] classed engineers by their occupational specialty and then identified sources that each specialty uses to find infor-

mation (Chart 1). The chart shows that engineers rely more on information sources within their corporations than do scientists. Research engineers who generally develop products which are contributions to the broad technological community depend on outside sources for information. Engineers in development, design, testing and analysis, whose work is of interest mainly to their own company and not to the field as a whole, rely more on inner organizational sources for information.

Gerstberger and Allen (Article 3) surveyed research and development engineers to determine what criteria they use to select information sources. Four criteria were studied: 1) *accessibility,* 2) *ease of use,* 3) *the quality of information, and* 4) *the familiarity with the source.* They found that accessibility was the primary reason for using a source.

In previous units, we have noted that people are often unaware of the information they need until after they receive it. Engineers are no exception to this rule. In Rosenbloom's and Wolek's study, both engineers and scientists reported that they were unaware of needing one-sixth of the information they received, until after they received it. Rosenbloom and Wolek conclude: "It is clear that information transfer is not just a problem of information retrieval. In the transfer of technical information in industrial laboratories, information looking for the man seems to be nearly as frequent an occurance as the man seeking information." [12]

The engineer's main information problems can best be solved by: 1) facilitating information flow between organizations; 2) making the channels likely to yeild the highest quality information also the most accessible channel; 3) translating scientific and technological advances into terms that engineers in other specialties can understand; 4) directing the right information to the right man before he asks for it.

FOOTNOTES: Information Needs of Scientists and Technologists

[1]See chapter on "Communication of Information."

[2]See the section on Engineers.

[3]Catherine B. Judd, *et al. Science Information Requirements of Scientists; Attitudes of Basic Researchers in Biology. Technical Report 4* (Silver Spring, Maryland: American Institute for Research, 1967).

[4]Saul Herner, "The Information Gathering Habits of American Medical Scientists," *Preprints of Papers for the International Conference on Scientific Information* (Washington, D.C.: National Academy of Sciences, National Research Council, 1958), pp. 267-275.

[5]J. D. Bernal, "The Transmission of Scientific Information: A User's Analysis," *Preprints of Papers for the International Conference on Scientific Information* (Washington, D.C.: National Academy of Sciences, National Research Council, November, 1958), pp. 67-86.

[6]Kurt W. Back, "The Behavior of Scientists: Communication and Creativity," *Sociological Inquiry,* XXII.(1962), 82-87.

[7]Arnold F. Goodman and S. O. Jones, *User Information Needs: The Challenge and a Response* (New York: Greenwood Publishing Corp., 1968), pp. 15-16; Lawrence Berul and Allan Karson, "An Evaluation of the Methodology of the DOD User Needs Study," *Proceedings of the 1965 Congress,* International Federation for Documentation (Washington, D.C.: Spartan Books, 1966), p. 153.

[8]Bernal, pp. 67-86.

[9]Bernal, pp. 67-86.

FOOTNOTES: Information Needs of Scientists and Technologists (cont'd)

[10]Thomas J. Allen, "Performance of Information Channels in the Transfer of Technology," *Industrial Management Review*, VIII (Fall, 1966), 87-98.

[11]Richard S. Rosenbloom and Francis W. Wolek, *Technology and Information Transfer, A Survey of Practice in Industrial Organizations* (Boston, Massachusetts: Harvard University Division of Research, Graduate School of Business Administration, 1970).

[12]Rosenbloom and Wolek, p. 19.

INFORMATION NEEDS OF SOCIAL SCIENTISTS

I. General Information Needs

When it became obvious that the information needs of scientists and technologists had to be dealt with -- for the satisfaction of their needs was of utmost importance to society -- librarians, information scientists, analysts attacked the problem with vigor. By 1969 almost 1,000 studies had been undertaken to determine scientists' behavior in gathering information, on the flow of information, on the classification of information, on their need for factographic and documentary information, and on the exchange of information. The fact that these investigations had to deal with physical, natural and applied scientists was no deterrant to the investigators. It seemed that scientists worked alike and in a predictable fashion. What one learned about one group of scientists might be transferred to another. In addition, scientists were extremely outspoken about the need for studies and satisfaction of these needs.

The social scientists, on the other hand, present an entirely different picture. They had not confronted librarians with their needs in the same way as had the physical scientists. As late as 1969 Line (Article 1) noted the overwhelming number of studies of scientists' information needs as contrasted with the few studies of social scientists' needs. In his bibliography, Line listed twenty studies by the American Psychological Association (1963), Appel's study of the bibliographic needs of social and behavioral scientists, and Louis Utterschaut's work. In 1965 Paisley studied the flow of behavioral science information. He concluded that there was no literature to review and then attempted to extrapolate some needs from the findings of user studies in the physical sciences. He stated that, "We shall infer that information flows to and from the behavioral scientists in much the same way that it flows to and from the physical scientists." [1] Few studies are included in the *Annual Review of Information Science and Technology*. In the first volume, Menzel mentions the American Psychological Association studies and Paisley's study, but then continues with the natural sciences. In 1969 Allen includes

ten reviews in the social sciences and in 1971, Nan Lin reviews a few more. The most intensive study is the work of J. Michael Brittain, *Information and its Users.* Chapter III of this book, unfortunately far too long to be reproduced, is one of the most inclusive studies of the needs of the social scientists. Brittain discusses empirical studies of "user information needs and requirements . . . in some detail, and brings together certain theoretical writings that have a bearing on nature, organization and use of social science information." Significantly, he states: "User studies like their counterparts in the sciences, have been carried out in the absence of conceptual frameworks although Kochen (1969) maintains that a new discipline is in the making and that user studies will form a part of this discipline; so it is possible that the state of this theoretical poverty will not continue."[2]

Maurice Line, assisted by Brittain, can be considered the forerunner in studying the needs of social scientists. In 1967, Line obtained funds to organize a study using a methodology different from that used to determine the needs of the physical scientists. He designed a forty-page questionnaire ". . . whose bilious green color still raises the gorge in social scientists all over the country." This questionnaire yielded so many answers that correlations are still being made. Line found, for instance, that social scientists were extremely print-oriented, preferred English language materials, wanted statistical, methodological and conceptual information rather than historical and descriptive, and preferred to perform their own literature searches. The questionnaire also indicated that needs varied among social science practitioners. For instance, teachers and social workers differed in their awareness of an information problem and in their admission of a need to be informed. "Social workers had . . . a sort of information conscience; teachers, on the other hand, where they were not plain apathetic, showed some suspicion, even hostility toward educational research; they saw the need to keep up with the subjects they taught, not with educational theory, research and practice."

While much of Line's study was directed toward a determination of the need or demand for documents, Bisco (Article 5) and Deutsch (Article 6) explore social science data bases, still another facet of documentary need.

> Social science data banks or data archives are a new facility for social science teaching and research. They developed out of the need of many social scientists to exploit better the masses of governmental, academic and commercial data produced and accumulated over the past three decades . . . Although usage of these new facilities has rarely equalled or exceeded the expectations of their creators, they have in their brief existence been found beneficial by thousands of graduate students and by hundreds of social scientists. [3]

Although social scientists need data bases, there are many difficulties associated with their use. Foremost is the difficulty of matching specific data holdings with immediate research needs; others relate to the geographic scattering of sources, the difficulty of extrapolating information from the data base and the lack of standardization in software.

A different approach to the study of information needs was undertaken by Porat and Haas in 1969, [4] concerning the amount of information needed by social scientists.

> In the applied fields it may be possible, and sensible, to attempt to measure the minimum amount of information that is required to complete a task: not only may too much information be disruptive to the task, or the research, but the retrieval and supply of information is costly, and the filtering, assimilation and processing is costly in terms of users' time and energy. In pure research it may never be possible, or sensible to work along these lines. In research the SERENDIPITY VALUE OF INFORMATION IS OFTEN HIGH, AND THE ATTEMPT TO PROVIDE JUST ENOUGH INFORMATION TO COMPLETE SOME A PRIORI ESTABLISHED GOAL WOULD CERTAINLY MEET WITH STRONG DISAPPROVAL FROM RESEARCHERS. [5]

Nan Lin's study, on the other hand, focuses on the psychological aspects of social science user behavior rather than needs, and

primarily the relationship between motivation and information seeking, information usage, and the relationship between personality factors and creativity and productivity.[6]

One of the major problems in pursuing the study of information needs in the social sciences is a result of changes in research methods. In the field of economics, for instance, Dunn (Article 3) states:

> . . . there is a pronounced movement away from the deductive conceptualization that characterized the earlier efforts on the profession to a much larger commitment of effort in the utilization of empirical information . . . The contextual framework in which the economist is working has altered. He is more interested in the way in which the transformation of the total economic system impacts, to their advantage or disadvantage, upon subsystem components of the total economy.

Political science is another case in point. In the nineteenth century, emphasis in methodology was primarily on theory, philosophy and description, presuming a need for books, periodicals and essay-type literature. The twentieth century researcher in the political science field requires a different type of information -- factual, statistical and numerical. This situation creates the need for social data banks. Changes in research methodology have also taken place in anthropology (Amsden, Article 4).

Robinson (Article 7) and Lowi (Article 8) represent approaches to information needs inferred by studying the nature of social science research. Political scientists, for instance, need information to cope with the impact which the information technology is having on the citizen, his participation in decision-making, his social movements, and his personal privacy.

The political scientist also needs to know the impact which the information technology is having on the executive, legislative, and judicial branches of government. Robinson observes:

> Twentieth century policy-making differs from that of the 19th century in at least two ways that concern us: more problems or issues now reach the agenda of government, and information about public questions is now more extensive and complex. [Governments are more involved in issues than formerly due to] increasing social complexity, new influential philosophy of welfare and the information revolution. . . . Policy makers involved in decision-making about the deprivations of certain groups of society must grapple as much with the information about the problems as with the problems themselves. Before 1860, legislators had a relatively limited number of issues. These issues lasted 50 years . . . slavery, the tariff, internal improvements. It was an era in which debate centered on broad normative issues and purpose rather than on empirical questions of effectiveness of alternative avenues to seemingly agreed upon goals.

The increased numbers of information-gathering agencies serving the executive branch of government is one of the reasons attributed to change from congressional dominance to executive leadership. With additional information, the executive has advocated its point of view in the news and editorial media, and with party organizations in the states. Congress and the Executive have switched traditional roles about initiating legislation due to the fact that the Executive has been identifying problems, thereby dominating Congress' agenda.

Janda identified a number of studies which have indicated that the information problem is the major factor in the decline of modern legislatures. He cites the Griffith, Woll, Keefe and Ogul report which identifies Congress' deferment to the Executive for answers and recommendations. "Regardless of how much Congress has attempted to inform itself . . . its store of information and its access to necessary knowledge are rarely if ever as developed as that of the executive authority."[7]

In 1963 Dartmouth's Public Affairs Center took a random sample of eighty representatives. Each respondent was asked to "name any problems which prevented him from carrying out the role he would like to play in the House and all problems which he saw as preventing the House from operating as he thought it should." The greatest problem, the respondents suggested, was "complexity of decision-making; lack of information." [8]

The creation of huge banks of information on the citizenry is a problem in itself. An article in the *Los Angeles Times* (September 17, 1972) pointed out some of the problems of protecting the individual and society from misuses of material:

> Information gathered, correlated and searchable is power. It is also highly saleable. Leaving Watergate aside, if a credit bureau does bust, as it does from time to time, the information that it holds as computerized data on tapes, disks, or whatever, is an asset. Very properly, it must therefore be sold to help meet the claims of creditors. If information about you is among the assets, it goes with the sale. Data . . . such as social surveys, market surveys, etc. can be freely bought and sold. It is possible for information to be used speculatively and on a massive scale and it is conceivable that individuals could become subject to new and possibly unsavory pressures.

We turn to studies of needs in other disciplines in the social sciences. We have observed that few studies have been undertaken in economics, anthropology and sociology. Far more attention has been given to information needs in the field of political science, applied economics, business and industry, psychology and education. The field of anthropology is so interdisciplinary in nature that some of the needs of the anthropologists can be assumed from the studies done in the natural sciences. Amsden (Article 4) studied the need for a new type of gatekeeper as well as information exchange. She emphasizes the anthropologists' need for person-to-person contact. Bogg's study (Article 7) was undertaken to introduce changes in professional publication. He perceived that much of the information sought by

anthropologists was "lying fallow, being used by the individual who did the work in his classes and an occasional conference paper, but not available to others in usable form". He noted that much sorely needed data that should be published was in the form of field notes and laboratory observations.

Obviously, a considerable amount of study is still needed in the social sciences. A workable methodology is needed to study the needs of social scientists which differs from that used to study the information needs in other fields. Brittain points out that the pattern of future information needs studies should be tempered by factors internal to the social sciences; general attitudes to the organization and support of research; and technical aspects of information transfer including mechanization.[9]

II. The Information Needs of Business and Industry

The most visible and possible the most adequately served group requiring information is that of business and industry. This is owing to the fact that industry recognizes that knowledge must be made available for "practical application" and that intelligent decisions cannot be made without data. Recognizing these needs, large industrial complexes were among the first to establish their own libraries and information centers. Credit bureaus, census centers, centralized data processing centers also became available for a price. ("Information Becomes a Hot Item," Article 1).

The federal government's perception of a need for information on the part of the business and industrial community resulted in the passage of the State Technical Services Act and the establishment of the Office of State Technical Services in the Department of Commerce. Other state governments followed suit and commissioned information need studies of the business and industrial community.[10]

As a result of the State Technical Services Act, university centers were designated as regional information and communication exchange centers for business information. Notable among these was the center established at Rice University in 1967 which described itself as a complete scientific and technical and information exchange center to serve the information needs of business and industry.

Most of the studies of the business and industrial community have focused on the following questions: 1) Who needs information, and 2) What type of information is needed?

1) Who needs information?

One of the best introductions to this subject can be found in Meltzer (Article 2). He identifies the user as management, staff, and technical personnel "located at all levels of line, line and staff, and committee organizations."

2) What type of information is needed?

Henderson (Article 3) identifies a need for information about other businesses, for instance, their location, address, their identification, and evaluation of their products and processes. There also is a need for legal and financial information.

Top management generally needs information on trends and data for decision-making. As Meltzer points out, "It is obvious that regardless of how the organization is established, the four functions of administrative or technical management must be performed. . . . Management must plan; make forecasts, create market prototypes, conceive services, analyze markets, determine broad policy formulas. Information is needed to make profitable decisions . . . [management must organize] for maximum results at minimum expenditures." For all these functions information is needed about men, machines, methods, materials, money and markets.

Middle management needs information about costs and inventories; first line management needs very specific information in order to transmit work instructions and conduct operating transactions.

In spite of the fact that the business and industrial community has been aware of its need for information, and in spite of the fact that services and information centers have been established to satisfy their needs, the business and industrial community has not always been responsive to these services. The university regional information and communications exchange centers established throughout the United States as a result of the State Technical Services Act languished for lack of use. These Centers were not refunded. Special libraries located in the business and industrial complexes are among the first whose services are curtailed when profits drop.

This seems to indicate that there is still a need for study of information needs. It indicates that perhaps business and industrial management, inundated with paperwork and information, need studies which will help create, control and communicate information.

III. Information Needs of Publishers

Publishers are producers, consumers, and communicators of information, and have information needs of their own, as well as a responsibility for meeting the information needs of the general public. In one of the few studies on publishers' information needs (Article 1), Jack Haskins discovered the greatest general need for information in the mechanical/production and personnel catagories; a lesser need for information was expressed about editing, circulation, reporting, and advertising. It would appear that publishers tend to favorably regard technology as a "solution" to problematic situations in the communication of information. Yet, when queried about specific problems on which information is needed, publishers responded with a majority of editing news problems focusing on product improvements for current readers or to attract new readers.

These comments reflect the tension between making profits and meeting actual information needs of the general public. Still, if newspaper publishers are serious in raising questions about the needs of their audiences, newspaper research may be directed to describe and measure just what information needs we all have.

IV. Information Needs of Urban and Municipal Planners

Urban and regional planning was a significant trend in the sixties.

> The great expansion of our urban areas over the last two decades has too frequently been carried out in a sprawling, space-consuming, unplanned and uneconomic way . . . if the taxpayer's dollar is to be wisely used and our communities are to be desireable places in which to live, we must assure ourselves that future growth takes place in a more orderly fashion.[11]

Planners responsible for creating an environment in which we can survive must have access to particular kinds of information. Hearle's articles "Information System for Urban Planning" (Article 1) and "Information Systems for City Management" (Article 2) identify many of the problems facing the planner in his quest for information. Hearle found that data systems created for specific functions, such as student files, police files, employment files, not only frequently duplicate each other, but are also difficult to locate since each is stored in a different department. The information collected for one agency is generally unknown to users of another and is usually not shared because of jurisdictional, mechanical or procedural obstacles. This suggests, therefore, a positive need for planners to *know what information is available and where.*

Hearle further identifies the kinds of information needed to manage a municipality and stresses the need for a unified information system to reduce duplication in collection, storage and processing. He suggests that information systems should be developed on the theory of *availability of information* rather than on the *information requirements* of planners and managers. According to Hearle, by having all information available without concern for the user's needs at the moment or for what the user will do with information, more information will be utilized and more of the needs of the planners satisfied .

Recommendations for planning and designing regional and urban planning information systems are discussed in reports by Thomas E. Sawyer [12] and the San Diego Comprehensive Planning Organization (Article 3). These reports assert that the needs of planners are entirely different from those of persons engaged in routine governmental functions and they present a general framework for an information system to meet the needs of the planners. Much of the information needed in planning is directly related to decision-making for which a particular type of data must be collected and stored. For instance: Where should a freeway be located? How much and what type of transit is needed? How many parks will serve recreational demands? Information systems are designed to provide such data.

Almendinger recommends a system approach responsive to the users of the system.

> A well-designed system is tailored to the requirements of its users and does not place upon them an undue burden of mastering a new discipline. The system provides its users with the information they need, and as closely as possible, it provides the information in a form suitable to its effective use. The first questions a system designer must ask are: "Who are the users and what are their requirements?" The answers to these questions determine the characteristics of the system and form the basis for the technical design which precedes implementation.[13]

Articles in this field repeatedly stress the following needs: 1) collect and store information in such a way that it will be easily accessible; 2) combine like fiels from different agencies in one location; 3) provide information in a form useful to other agencies; and 4) create an adaptable and versatile information system.

One of the few studies which recognizes the need for empirical evidence of the needs of planners was prepared by Brenda

White. She found that:

> Determining the precise nature of users' information requirements in any subject field is a difficult exercise, simply because the requirements are rarely articulated by the users themselves, and this in turn is because they are rarely aware of them.
>
> In planning, and in particular in the practice of planning, the need for data is more clearly articulated than the need for information, because more planners are aware of the former need than are aware of the latter. The data requirement is fairly specific: it is for quality rather than for quantity, is directed at the non-comparability of data collected by different agencies for different purposes . . .
>
> The information requirements of planners are much less clearly defined, if they are defined at all, by planners themselves . . . To achieve a valid indication of information requirements . . . would require a survey of nearly 3,000 planners . . . [14]

The information needs of planners are different in many respects from those of other social scientists and require still further study. Only a slight step forward has been taken in this direction.

IV. Information Needs of Clinical Psychologists

At several points throughout our report we have mentioned the distinction between information needs on the conscious level and those on the level of the sub-conscious. The plethora of studies measuring information-seeking behavior follow from our active processes of data-collection which represent, for the most part, our expressions of conscious needs for information. The accepted practices of quantitative measurement very often restrict our explorations into the sub-conscious area, the level Taylor identifies as the *visceral* need.[15] We have said that the actual but unexpressed needs for information on this primary level is within the concern of analytic psychology. It might be interesting therefore to look at the information needs and problems faced by clinical psychologists themselves.

Suzanne Prescott and Belver Griffith produced *A Descriptive Study of Information Needs and Practices of Clinical Psychologists.*[16] This study consisted of a survey of the information-gathering and generating activities of 800 clinical psychologists and 378 persons in related fields, and revealed two particular information needs of clinicians: 1) a need for specific information related to their functioning, and 2) a need for a suitable information system.

Clinical psychologists reflect the same specific information needs basic to any group of scientists. And, like other professionals, psychologists are facing problems having their needs satisfied. In reporting "Some Assumptions and Problems in Psychology's Information Crisis" (Article 1), Robert Holt says: "The problems of scientific communication have been approached from one vantage point, primarily that of mechanized information processing. The undoubted merits of computers in this kind of work seem to have made many of us overlook the fact that the problems we face are not primarily technological." Holt calls for "further studies of what psychologists themselves perceive to be the main problems in their interaction with the literature."

This recent and ongoing discussion of the relative merits of a National Information System for Psychology (NISP) is pre-dated by John Darley's notation of "Information Exchange Problems in Psychology" (Article 2). While this article is another report of information-seeking behavior, it does contain some early findings of the American Psychological Association's Project on Scientific Information Exchange in Psychology. The author makes an especially pertinent point about technology:

> If further research indicates that similar patterns characterize other scientific disciplines, one may question those computer technologies that take as their starting point archival materials and then concentrate on retrieval techniques for information therein. It is conceivable that those needing to know already know before archival interment. One may also question the development of computer technologies prior to adequate understanding of the information needs for storage and retrieval to be met by the technology.

Besides highlighting the use of informal channels of information exchange (communication) by productive (i.e., publishing) scientists in psychology, Darley points up some information needs of researchers addressing themselves to scientific information exchange in psychology:

> "We do not yet know enough about information use and needs in the teaching process, in good and bad teaching situations."
>
> "We need more information on delayed search of archival materials."
>
> "We need more critical study of consensus and validity in the editorial gate-keeping function."

One final study is recommended within the scope of this unit. "Information, Systems, and Psychoanalysis: An Evolutionary Biological Approach to Psychoanalytic Theory," by Emanuel Peterfreund, presents speculative considerations in technical language. Peterfreund describes the "optimum" psychoanalytic process as "a feedback-regulated information-processing system." He uses "information" in a strictly

physical sense and takes the position that "psychological experiences parallel or correspond to the way information is processed in the central nervous system."[17] Psychologists apply the term "Information" both to the context of counselor-patient communication and in the context of neurological processes within the patient.

Though this study does not address itself to the specific *information needs* of persons who are helped through the counseling process, it does open the door to a systems approach to psychoanalysis which may make such considerations not only possible but necessary as well. As Peterfreund puts it,

> Certainly there is little doubt . . . that communication channels and information processing are present [within human being] . . . I believe that psychoanalysis cannot continue to ignore the basic facts and the general approach of modern neurophysiology and of twentieth-century science. Indeed, it is my basic point of view that with the aid of information and systems concepts psychoanalysis can now begin to use these modern viewpoints very profitably.[18]

Other units in this section of our report have examined studies of the information needs of various professions. Because of the relatively few studies available in this area, and because of the nature of the profession itself, this unit has been more of a general essay on the information needs of clinical psychologists.

FOOTNOTES: Information Needs of Social Scientists

[1]William J. Paisley, *The Flow of (Behavioral) Science Information; a Review of the Research Literature* (Stanford, California: Stanford University, Institute for Communication Research, 1965).

[2]John Michael Brittain, *Information and its Users, A Review with Special Reference to the Social Sciences* (Bath, England: Bath University Press, 1970), p. 34.

[3]Ralph Bisco, ed. *Data Bases, Computers and the Social Sciences* (New York: Waley-Interscience, 1970), p. 1.

[4]Brittain, p. 149.

[5]Brittain, p. 149.

[6]For further discussion see Nan Lin and William D. Garvey "Information Needs and Uses," *Annual Review of Information Science and Technology*, VII (Chicago: Encyclopedia Britannica, 1972) 5-37.

[7]Kenneth Janda, *Information Retrieval; Applications to Political Science* (Indianapolis, Indiana: Bobbs-Merrill Co., Inc., 1968).

[8]Janda, p. 311.

[9]Brittain, p. 156.

[10]See, for instance, George A. Bonn, *Technical Information for California Business and Industry; A Report to the California State Librarian* (Sacramento: California State Library, 1966); and Arthur D. Little, Inc. *The 3 R's Program: Meeting Industry's Informational Needs. Report to the Division of Library Development. New York State Library* (September, 1967).

[11]Lyndon Baines Johnson, "An Information System for Urban Planning," *Urban Planning Bulletin, No. 1.*, U.S. Housing and Home Finance Agency, Urban Renewal Administration.

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FOOTNOTES: Information Needs of Social Scientists (cont'd)

[12]See Charts A & B in Thomas Sawyer's work.

[13]Vladimir V. Almendinger, Emory W. Franks and Joel M. Kibbee, *Urban and Regional Information Systems; On the Threshhold of a Technology* (Santa Monica, California: Systems Development Corp., 1966), p. 5.

[14]Brenda White, *Planners and Information, a Report of an Investigation into Information Provision in Town and Country Planning* (London: Library Association, 1970). See Appendix A (PL. 1).

[15]Robert Taylor, "Questions-Negotiation and Information Seeking in Libraries", *College and Research Library* (May, 1968), pp. 178-194.

[16]Suzanne Prescott and Belver C. Griffith, *A Descriptive Study of Information Needs and Practices of Clinical Psychologists* (Washington, D.C.: American Psychological Association, 1970).

[17]Emanuel Peterfreund, "The Concept of Information," *Information, Systems, and Psychoanalysis: An Evolutionary Biological Approach to Psychoanalytic Theory, Psychological Issues*, Monograph 25/26, Vol. VII (New York: International Universities Press, 1971), p. 121.

[18]Emanuel Peterfreund, "On Meaning," *Information, Systems, and Psychoanalysis: An Evolutionary Biological Approach to Psychoanalytic Theory, Psychological Issues*, Monograph 25/26, Vol. VII (New York: International Universities Press, 1971), pp. 154-55.

INFORMATION NEEDS IN THE FIELD OF EDUCATION

There is a growing awareness in our society that there is no single answer to the question, "Who runs or should run American public education?" Federal, state, and local authorities, school boards, superintendents, principals, teachers, citizens, parents, and students all claim the right to participate in the process of making decisions about education. However, there is little agreement about who has the right to make what decisions. Each of these groups is both a producer and a user of information about education. For example, many parents believe that in order to teach effectively, schools need more information about their children and their cultural background and that parents need information about schools in order to effecitvely participate in educational decision-making.

Inasmuch as none of these groups has been intensively studied, relatively little is known about their need for educational information. Brittain's observation that, "The field of education has been very inadequately covered by user studies, although education is perhaps better covered by bibliographical tools and information services than any other social science," (Article 1) is still true. However, several information-need studies recently have been undertaken in the field of education. A number of reasons account for the current interest in this type of study: 1) The increased technological capacity for developing information systems; 2) The increased size of the educational system and the resultant concern for efficiency; 3) The fact that recently "many leading educators became acutely aware that what was being taught about a subject in the classroom was far out of touch with the most advanced knowledge on the subject"[1] ; 4) The lack of clarity about decision-making roles of the various interest groups, and their increased demand for wider participation in educational decision-making; 5) The concern to develop information systems that are responsive to users' needs. For example, Rittenhouse's *Innovation Problems and Information Needs of Educational Practitioners*[2] attempts

to provide the Office of Education with a procedure for discovering problem areas in schools and information needs of educators, so that local school people can be given information needed to carry out their day-to-day work.

The investigation of information needs in education is relatively young. The focus of many of the studies which have been done is to develop and test instruments for determining information needs. They also provide some insight about which users of educational information need what *kind* of information, in what *form* and from what *sources* these users want and get information.

Four studies are particularly helpful in answering the question, "What kind of information do practicing educators need?" [3] Paisley and Mick's study (Article 2) reports the information needs by educator's level-elementary or secondary-and by position-teachers or administrators. Elementary and secondary school teachers most frequently indicate a need for information about teaching techniques, particularly with respect to motivation of students, and instruction in reading, English language skills, and mathematics. The principal difference in needs between elementary and secondary teachers is that the former desire information about early childhood education, whereas the latter want information about teacher-student relations.

In the Chorness [4] and Rittenhouse studies, which focus on decision-making, planning, and innovation, teachers indicate a need for information about curriculum planning, problems of grouping children, flexible scheduling, and merit pay systems; both claim that inadequate information about these topics is a major cause of breakdown in planning.

Teachers and administrators both indicate a need for information about teaching techniques, teacher-student relations, and curriculum planning and development. The teachers' classroom orientation is further suggested by the National Education Association study. [5] The teachers indicate that the problems that have a con-

siderable effect on their work are: too wide a range of student achievement, too many students to work with each day, too many non-instructional duties, and too many students indifferent to school. Topics generally regarded as major social problems, i.e., students' diverse ethnic and socio-economic backgrounds, students' health and nutrition problems, and students' use of drugs, are said to have little or no effect on their work. Administrators want information about scheduling, teacher performance, pre- and in-service training, general administration, and school-community relations. Elementary school administrators were more interested in the classroom and children's development and experience than were secondary school administrators.

In the Paisley and Rittenhouse studies the needs of personnel in higher education are tangentially included. Rittenhouse found that this group did not express a need for as many kinds of information as public school personnel. College administrators want information about student evaluation of faculty, calendar changes, grading and other evaluation methods, planning and budgeting procedures, interdisciplinary studies, and solutions to the drop-out problem. Line, Brittain and Cramer (Article 3) contend that "there is a marked difference in information requirements between lecturers engaged in research and those involved in teaching only." Lecturers engaged only in teaching want either specific pieces of information or general information about a topic, whereas those in research want extensive, in-depth information.

A number of state education departments are developing information systems to plan educational programs more effectively. They want information about the current status of schools, about situations such as race relations which are out of control in a particular school or community, potential trouble areas, and about recent educational trends in the state. In addition, they want to improve their capacity to provide schools and colleges with information that will aid them in educational planning and decision-making. [6]

Increasingly, state departments of education are also seeking to involve citizens in determining educational needs and priorities. The initiative for citizen involvement in education comes not only from the educational system but from citizens themselves, especially parents. Although there is presently no nation-wide parents' movement, parent groups are active in communities throughout the United States.

Citizens' educational information needs have not been studied in any detail. Generally this group tends to state its concerns about education as problems or complaints rather than information needs. For example, in Dervin's Seattle study,[7] citizens point out a number of concerns about education: financial aid for education, the high cost of education, the poor quality of educational information, the poor quality and dangers of schools, busing, and the competence of teachers. In the Dayton study,[8] inferences regarding citizens' information needs can be drawn from their opinions on a number of issues, such as discipline, Superintendent/Board of Education relations, equal education, and social and economic integration, and busing.

There is ample evidence that citizens' behavior and attitudes are not substantially affected by new information, especially when this information is stated in the jargon of educational researchers or reformers. Further, few people in communities have the background and experience necessary to deal with educational issues, and many citizens mistrust the school system as a reliable source of information. Therefore, a substantial effort will be required to increase the multiple publics' capacities for dealing with information effectively. This will involve developing citizens' capacities to seek information, to understand and translate it, and to utilize it to influence decision-making.

Citizens seem to need information to:

--increase their competency to understand and use presently available information;

--enable them to gain access to information to which they have a legal right;

--help them to evaluate educational practices and products;

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-- help them ask the right "why" questions as they attempt to monitor and evaluate their children's school experiences;

-- learn who makes decisions regarding policy and administrative practices;

-- provide a general picture of the school system, its present status, its priorities and its practices.

In what type and how many sources do users of educational information want and use information? Though teachers and administrators (K-12) receive [illegible] to keep up with recent trends and developments in education, they are not active searchers for information. [illegible] on specific subject [illegible] easily assimilated."[3] Chorness claims that [illegible] journals than on [illegible] Information Center (ERIC) [illegible] indicated that they know [illegible] but do not know the source of these [illegible] public school personnel [illegible] "demonstrate great diversity of formal and informal media in the course of their work; they seek and are eager to use information on current research." [10]

Studies are needed which specifically report the information problems of educators. It is difficult to determine whether there is ignorance of available information, a lack of information on certain topics, or a lack of knowledge of the school's problems. Further replication studies are required to test initial findings.

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FOOTNOTES: Information Needs in the Field of Education

[1]John K. Hemphill, "Information Needs in Education," *Proceedings of the 1965 Congress,* International Federation for Documentation (Washington, D.C.: Spartan Books, 1966), p. 185.

[2]Carl H. Rittenhouse, *Innovation Problems and Information Needs of Educational Practitioners* (Menlo Park, California: Stanford Research Institute, 1960).

[3]The term "practicing educators" refers to school personnel (teachers and principals: K-12), and district office personnel (administrators, program specialists, and consultants.)

[4]M. H. Chorness, *et al., Decision Processes and Information Needs in Education. A Field Survey, Part II of a Study* (Menlo Park, California: Stanford Research Institute, 1969).

[5]"Finding Out What Teachers Need and Want," *Today's Education -- NEA Journal* (October, 1972), pp. 31-35.

[6]Missouri Commission on Higher Education, *Specification for a Higher Education Information System* (Chicago: Cresap, McCormick, and Paget, 1968).

[7]Brenda Dervin, "Report on Information Needs Survey -- Seattle and Syracuse," *Information Control: The Use of Information in Everyday Problem Solving,* co-authored by Brenda Dervin, John Bowes and Douglas Zweizig. Sage Annual Review of Communications Research, Vol. II, edited by F. Gerald Kline and Peter Clarke (Beverly Hills, California: Sage Publications, 1973, in process).

[8]*Four Views of the Dayton Schools: Pluralism in Action.* (Dayton, Ohio: Public Opinion Center, 1972).

[9]John Michael Brittain, "Studies in the Social Sciences," *Information and its Users, A Review with Special Reference to the Social Sciences* (Bath, England: Bath University Press, 1970), pp. 34-120.

FOOTNOTES: Information Needs in the Field of Education (cont'd)

[10]Rittenhouse, p. 27.

INFORMATION NEEDS OF THE GENERAL PUBLIC

Everyone needs information. This truism, unfortunately, represents the one definitve statement that can be made about information needs of the general public. The problem is that information needs do not exist as universal and objective entities; they are formed by individual characteristics and environmental circumstances. And, because a great many people have difficulty conceptualizing their information needs, much less articulating them, such needs must be inferred. What is needed is a method whereby inchoate needs can be mainfested in terms of specific information requirements -- a formal statement of the need.

Such a method does not yet exist, but an examination of the concept of information does suggest an approach that will at least isolate the problem and render it more manageable. Colin Cherry states that "Information can be received only where there is doubt, and doubt implies the existence of alternatives -- where choice, selection, or discrimination is called for." [1] Information reduces uncertainty in making selections. But (to compound the complexity) the process of decision-making is very frequently an unconscious one, and the acquisition of information is often accomplished without overt action on the part of the recipient. Such information is unconsciously organized and stored for present or future use.

Thus, there are two kinds of information needs. In one case, the need is shaped by an activity, such as decision-making or problem-solving; in the other, the need is latent and is manifest through a passive reception of information which is stored as knowledge. As knowledge increases, whether actively or passively, it tends to generate specific additional information needs. The two kinds of needs, therefore, are neither static nor compartmentalized; they blend with each other and they vary with passage of time. "Information," as we have said, "is a symbol or a series of symbols having a potential for meaning." All these generalizations, though they obviously do not constitute a methodology for articulating information needs, do provide

a context for examination of the potential for articulation.

Who has needs for information? What kinds of information do they (we) need? The focus of Part II of this report has been on information needs in various fields or professional contexts. Taylor has indicated that the general concept of information needs can be studied -- *only?* -- in relation to particular, identifiable groups or publics. These may be specified according to age, education, income, profession, and other demographic characteristics. Studies of particular groups, though, generally deal more with information-seeking behavior than with actual information needs. For example, two studies concentrating on "older adults" do not isolate various information needs. [2] Research on ghetto residents and the urban poor also has stressed information-seeking behavior and information dissemination. One recent study did identify "clearly defined population groups with special needs" but reported the obvious results in most general terms. [3] With visible concern for minority groups, this study attempted to identify the information needs of various sub-groups of the population that had information needs "significantly different from the needs of the national population in general." Among the sub-groups were: older people, young children, reservation Indians, rural populations, college and vocational training students, migrant workers, illiterates, the mentally retarded, prison inmates, and physically handicapped persons. Identification of the needs of such sub-groups of our population, with a view toward providing more effective services for these people, is without question a most important task. This particular study however reported only such general needs as better physical access, special forms of materials, and special content of collections.

An early (1965) survey of the adult population of five counties in Michigan's Upper Peninsula yielded data on information sources and needs. [4] The 2 percent sample identified financial matters, occupational, professional, and farming matters, public affairs, consumer information, and educational and career planning as "topics of major importance in everyday life on which it was 'particularly difficult to find useful and reliable information,'"; sources of information presently

in use concerning the topics mentioned were also specified.

Current consideration of the concept of "information needs" may be partly responsible for the significant shift in the fundamental direction of services some libraries are seeking to provide. The move is from a "warehouse" or repository of "knowledge" based on elitist principles to a model based more on people and activities, as exemplified by the Neighborhood Information Center. The idea of a public library serving as a neighborhood information center is not new, though novel methods are being tested to overcome the anti-institutional bias many people hold toward libraries. Also, libraries are trying to take seriously the needs of various population groups through research into the communities they hope to serve. The most recent and thorough study of neighborhood information centers is found in *A Proposal to Research and Design Criteria for the Implementation and Establishment of a Neighborhood Information Center in Five Public Libraries in Five Cities: Atlanta, Cleveland, Detroit, Houston, and Queens Borough.* [5] This report chronicles the renewed concern for on-the-scene user groups.

In Cleveland, for example, two neighborhoods were chosen for surveys "conducted to elicit specific community needs and indicate priorities in each neighborhood selected." [6] The ninety questionnaires completed in the Woodland area, a primarily black neighborhood, were felt to be representative of a majority of the residents of that community. This survey revealed that:

-- information needs of residents are only fairly well met

-- information resources of the community are not fully used

-- the five most important needs of Woodland residents were:
   1) housing
   2) employment
   3) city services
   4) health care services
   5) food and food stamps

The survey also revealed that 77 of 90 persons thought their own branch library would be a convenient information center.

Dorothy Turick, author of the report on Cleveland, clearly states the situation:

> The survival of the public library, as such, is presently in jeopardy. As a social institution, its function is to provide for the *informational needs* within its community. Presently, it is often found wanting in meeting this function. As a service agency, it is responsible to its clients. In the most dormant instances its performance of this function is being ignored or bypassed. In the most alive instances, libraries and librarians are being asked to look to *new roles* and *new patterns* of service in that community.[7]

In Houston, Texas, two areas presently served by branch libraries were selected as target areas for a needs assessment survey. "In the preliminary draft of the survey it was reported that residents in the Carnegie area perceive libraries to be places in which you find out what to do and where to go if you have a problem, a 64 percent greater awareness than that of the residents in the Kashmere Gardens area. Residents of both areas seemed receptive to the idea of the Neighborhood Information Center."[8] The Houston study goes on to report the "problem needs" of each area as follows:

A. Information Needs of the Carnegie Residents:
   1. Medical and health services
   2. Money matters and taxes
   3. Services provided by the city
   4. Legal help
   5. Information about child care

B. Information Needs of Kashmere Gardens Residents:
   1. Services provided by the city
   2. Medical and health services
   3. Legal help
   4. Money matters and taxes
   5. Information about child care

The Houston report illustrates the re-thinking going on as library personnel give more thoughtful attention to the needs people have for information. As noted by Guadalupe Mier:

> Information and referral services are currently receiving nation-wide attention. The Federal Government has directed its people-oriented agencies to serve the information needs of the citizenry. The Neighborhood Information

> Centers project is an example of federal and local cooperation in Information and Referral in an attempt to cover all aspects of service. The public library as an information agency has too long been overlooked. Other Information and Referral agencies make use of it but only recently have they realized that it has an information function. This is now being remedied by the Neighborhood Information Centers which will be able to bring new insights into information and referral services through their library-oriented staff. One of the major purposes of library service is to connect requests for information with the proper answer or source, which includes resource persons and agencies as well as book and book-related materials.[9]

The project on Neighborhood Information Centers represents one approach toward the solution of local problems based on a need for information. Another approach -- and one offering less of an institutional profile -- has been taken by Bettie Armitage (Article 1). Ms. Armitage, "skeptical that libraries could overcome their governmental connection or institutional stance sufficiently to gain client trust," and convinced that "programs with an 'urban' emphasis are not necessary," helped establish an Information Contact Centre at Owen Sound in Canada. The Centre was not to be a "crisis center," but was to offer people the information needed to prevent crisis. During its first year of operation, the Centre had 2,500 users, 90 percent of whom needed more information than mere referral to another agency. Thirty percent of the needs concerned rental and homemaker inquiries. Other areas of need for information were expressed such as financial counselling, legal aid, child care problems, landlord and tenant problems, consumer complaints, unemployment and rehabilitation counselling, alcoholism, and home services.

The Neighborhood Information Center and the Owen Sound Contact Centre are not dissimilar in light of the identified needs for which they seek to provide information and appropriate referral. Whether future information services will be rendered through rather traditional institutions or through some other kind of agency is not as

important a question as is the whole matter of finding a method to determine genuine information needs.

One problem facing those who would do research on needs is the tendency to blur the distinctions among needs, wants, and demands. According to Rogers and Shoemaker, "a need is a state of dissatisfaction or frustration that occurs when one's desires outweigh one's actualities, when 'wants' outrun 'gets'." [10] Social psychology, accordingly, carefully notes the methods and problems in the measurements of wants.[11]

Can people think in terms of having information needs? If so, can they voice these needs as actual "needs for information" or must they be couched in some other form? How safe are we in providing services based on inferences drawn from some articulation -- however "inadequate" -- of an "information need"?

As we have said, the measurement of information needs of the general public poses problems so great that many of the studies purporting to examine information needs actually report information-seeking behavior. According to Brenda Dervin, "the everyday information needs of U.S. citizens are numerous and diverse. The nature of these needs varies radically from community to community, population sub-group to sub-group, month to month. While there is not a great deal of evidence available, the little available work suggests the immensity of the information need problem".[12]

One study was done recently to determine "the nature of everyday information needs expressed by general-population adults" (Dervin, Article 2). The study compared the information needs expressed by residents of Syracuse, New York, Seattle, Washington. In the former location, 460 adults were asked to think of instances in which they needed information about something and had found it difficult getting answers. In this survey, the respondents were not asked if they had a specific type of problem; yet 185 (40%) of the sample generated 160 different specific problems, most of which clustered around consumer shopping information and medical and health information. In the Seattle study, 316 adults were

randomly sampled from listings in the phone book. These respondents named 1,471 needs in response to 15 question probes, for an average of four problem statements per respondent.

Earlier we mentioned the specification of "information" as that which one needs when faced with a problem requiring some decision. This restrictive view of information has its roots in information theory and mathematical models of the communication process. Still, the idea of information vis-à-vis problematic situations may be the most useful when we set about measuring information needs. The study of the use of information in everyday problem-solving in Seattle and Syracuse employs a scheme developed by Westat Research, Inc., for its information needs study of the citizens of Baltimore.

Dervin's paper on "The Information Needs of Urban Residents: A Conceptual Context," [13] based on data from the Baltimore study, offers a conceptual model of the individual and his information needs (Article 4). Among the salient points Dervin makes are these:

> -- The average U.S. urban citizen is suffering from a large and ever-growing information crisis; citizens are frustrated in their attempts or unable to get information for everyday problem solving.
>
> -- Not one single systematic study with a well-sampled population was found which documents the nature of information needs or shows which type of people have which needs.
>
> -- The different perceptual bases of needs [citizens have] may well act as barriers to information accessibility. An individual may not be aware of his information needs or he may not be able to verbalize them.
>
> -- The entire definition and scope of a burgeoning information agency depends, in part, on how people perceive needs. If individuals do not separate information from help or service, then the entire basis for 'information' counselling is challenged.

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-- No empirical evidence has yet been generated which would help clarify the issue of information advocacy service in the U.S. A few guidelines are available from [illegible] evidence which suggests that the way people express their information needs are inexorably tied [illegible]

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FOOTNOTES: Information Needs of the General Public

[1]Colin Cherry, *On Human Communication* (New York: John Wiley & Sons, 1961), p. 169.

[2]See H. S. Nordick, *et al.*, *Telecommunications in Urban Development* (Santa Monica, California: The Rand Corporation, 1969). Brenda Dervin's summary of research ("The Communication Behaviors of the American Urban Poor," *Project CUP, Report No. 12* [East Lansing, Michigan: Michigan State University, Department of Communication, 1970])is another example of this emphasis, though her more recent research is directed toward information needs (see below).

[3]Charles P. Bourne, Victor Rosenburg, Marcia J. Bates and Gilda K. Perelman, *Preliminary Investigation of Present and Potential Library and Information Service Needs* (Berkeley, California: University of California, Institute of Library Research, 1973).

[4]Jon D. Kleper and Robert G. Anderson, "Information Source and Need Hierarchies of an Adult Population in Five Michigan Counties," (A paper presented at a national seminar on adult education research in Chicago, February 11, 1968).

[5]The report, called *A Proposal to Research and Design Criteria for the Implementation and Establishment of a Neighborhood Information Center in Five Public Libraries in Five Cities: Atlanta, Cleveland, Detroit, Houston and Queens Borough* (Project No. 2-0860 and Grant No. OEG-0-72-5168, was prepared for the Bureau of Libraries, Office of Education, U.S. Department of Health, Education and Welfare, 1973).

[6]Dorothy Turick, *Neighborhood Information Centers Project: Cleveland -- Phase I.* Final Report Project of Grant No. OEG-0-72-5168, "A Proposal to Research and Design Criteria for the Implementation and Establishment of a Neighborhood Information Center in Five Public Libraries in Five Cities: Atlanta, Cleveland, Detroit, Houston and Queens Borough," (Cleveland, 1973), p. 2.

FOOTNOTES: Information Needs of the General Public (cont'd)

[7]Turick, p. 4.

[8]Guadalupe Mier, *A Project to Research and Design Criteria for the Implementation and Establishment of Two Neighborhood Information Centers in . . . Houston* (Houston, 1972), p. 5.

[9]Mier, pp. 1 and 7.

[10]E. H. Rogers and F. Shoemaker, *Communication of Innovations* (New York: The Free Press, 1971), p. 105.

[11]See, for example, David Krech, Richard S. Crutchfield, and Egerton Ballachey, *Individual in Society: A Textbook of Social Psychology* (New York: McGraw-Hill, 1962), p. 87f.

[12]Brenda Dervin, *Establishing a Shopper's Information Center* (Chicago, Illinois: The Public Relations Board, 1972). Dervin's pioneering research in this field of information needs is most impressive and may be traced by referring to citations of her work in our bibliography.

[13]Dervin's report was prepared as part of a study of the information needs of urban residents for the Office of Education, Division of Library Programs, 1973. The contract No. EC-P-UL-4555 is being administered by the Baltimore Regional Planning Council. We have included as Article 4, only those sections of Dervin's report which directly pertain to information needs.

CRITIQUES OF USE AND USER STUDIES

Critique of User Studies

There appears to be a constant struggle to keep abreast of studies of information use. Syntheses of studies appear with some regularity, each covering a given period of time and generally referring to previous syntheses. Most of these tend to be descriptive rather than critical.

Berelson (1949), Menzel (1960), Davis and Bailey (1964), Paisley (1965), Wood (1971), and Bates (1971) surveyed the literature on information use studies in England and the U.S. since 1940.[1] Since its initial publication in 1967 the *Annual Review of Information Science and Technology* (ARIST) has included a chapter reviewing, summarizing and criticizing studies on "Information Needs and Uses."[2] Each of these reviews reflects the orientation of the compiler. While the chapters in ARIST are more selective and emphasize the information-seeking behavior of scientists and technologists, other studies have been done primarily by librarians to determine who uses the library and why. These consider the use of catalogs, reference services, circulation and facilities. Another cluster of studies relates to the extent to which information services satisfy specific requirements.[3]

Marcia Bates [4] evaluates 181 user studies. Her bibliography is divided into two parts: the library and the library user, and the information-gathering behavior of scientists and the general public. She examines the rationale of user studies and recommends several helpful articles on research methodology. Bates provided some critical commentary beyond that which normally appears in an annotated bibliography.

Carter *et al.* (Article 1) examines the adequacy of 58 selected studies pertaining primarily to the scientific and technical community. They identify behavioral patterns that have significance for

the development of future information systems, such as:

1) Principle of least effort
2) Resistance to change
3) Preference for oral communication

Carter deduces that systems should be easy to use, that change should be evolutionary, not revolutionary, and that these systems should facilitate the dissemination of scientific and technical information through oral communication.

Wood's *Review of the Literature from 1966 to 1970* (Article 2) looks more closely at information channels and the communication process than other reviews. His article is especially valuable because it includes many British studies which others neglect. Among his generalizations are:

1) Ease of use is a more important criterion than potential value when a scientist selects an information source.

2) The undoubted value placed on informal communication suggests that means should be developed (possibly some form of directory of interests, skills or research projects) that would facilitate interpersonal contact.

3) The lack of use of library tools such as abstracts, indexes and card catalogues suggests that library users need instruction in how to search for information. There is evidence that users actually desire such instruction.

4) As guides to the primary literature, titles plus well chosen keywords are just as reliable as abstracts. Abstracts are most important for helping workers to keep up-to-date without using the primary literature.

5) Mechanized information retrieval systems, at least in their present form, do not seem likely to supplant the more traditional methods of gathering information.

6) Libraries generally are overfull. Judicious weeding of collections based on the 80/20 rule would provide much needed space without significantly affecting the quality of service.

7) The flow of information could be improved by providing translation services within the users' own organization, or at least by making users more aware of national translation services.

8) Scientists and technologists want state-of-the-art reviews to keep up with the ever-expanding literature of their fields.

Critique of Methods

The methodology used to determine information needs is the same as that used in social science research. Such tools and techniques as questionnaires, interviews, diaries, observation, and analysis of existing data, and experiments have the same limitations in user studies as they have in social science research, mainly, that one can only infer from the user's behavior or words what is going on inside his head.

Wood (Article 4) considers the strengths and limitations of each method used to study information needs, and suggests ways to improve these methods. Although questionnaires and structured interviews are the most useful methods for producing quantifiable data, the standardized form of a questionnaire cannot always reveal a user's unique experience. The questionnaire leaves no way to determine the respondent's mood at the time or to clarify ambiguous questions or answers. The interview, though more expensive and time consuming, can do these things. A major weakness of questionnaires and interviews is that they cannot collect actual data on behavior as it happens. To overcome this problem, Carter *et al.* (Article 2) recommend a structured interview in which the user is asked to concentrate only on a specified time period or project. The resulting data will then reflect the user's active behavior rather than his opinion.

While questionnaires and interviews offer quantifiable data that can be compared over several populations and situations, they are not true measures of behavior. Diaries and observation may provide

more accurate indices of behavior, though their results often are difficult to quantify. While the diary method should reveal actual behavior, users often refuse to interrupt their work to record their actions.

Through observation the researcher can record the subject's behavior without disturbance. Although this method is better for determining information-gathering habits, very little information about the subject's *needs* can be gleaned by observation.

Some user studies rely on already existing data, such as recorded reference questions, to determine user needs. These studies obviously are limited, because they reflect only that type of information requested by a formal system, which comprises less than 5 percent of all information sought. Atherton's study of physicists' needs partially solved this problem by a questionnaire asking physicists to send requests to an "ideal reference retrieval system." [5]

Wall [6] suggests an experiment involving three teams of researchers working on the same problem, using the best possible information service, an average information service, and no information service at all, respectively. The experiment should show whether the type of information service has an effect on a team's success in problem solving.

As previously mentioned, the ARIST *Information Needs and Uses* chapters review studies of scientific and technical information users. Each reviewer has analyzed and categorized user studies from different methodological perspectives. Herner (Article 5) discusses the pros and cons of different methods as this paper has done. Menzel (Article 6) analyzes studies by their main focus, such as the information channel used, opinion and preference studies, and critical incident studies. Paisley (Article 7) considers the studies according to the environment -- such as the user in his research group and in other groups. Unfortunately, a major problem in the past has been improper or careless use of research techniques. Many researchers in the field of user needs are unacquainted with research methods of the field of social science. Consequently the results of such studies are questionable. Many such studies concentrate on one system to such an extent that their results, though valid for that system should not be applied generally.

The bulk of studies purporting to examine information needs have in fact evaluated the effectiveness of information delivery systems (libraries).

We feel that studies of needs should concentrate on *needs* rather than on the system supplying the needs. This is not to suggest that studies of systems' effectiveness should be discontinued in favor of information need studies; both kinds of studies are important but should be properly labeled.

Another problem obstructing the research of needs is the difficulty of identifying and measuring the variables interacting in the information transfer process. The Dept. of Defense (DOD) study is the first attempt to specify information as a quantifiable unit called an "information chunk." "A 'chunk' is the smallest quantity of information required to answer a task-related question. Twelve inches is a chunk when it answers the question'How long is a foot?'" These researchers also felt the need to measure information in terms of its value, depth, relevance, and specificity, but were unable to determine quantifiable units for these characteristics.

Closely connected to the problem of developing precise measures of information and the variables surrounding information transfer is the lack of precise language. For instance, the word *information* may mean one fact or a whole collection of documents. As discussed in the unit "Concepts of Information Needs," the terms *information wants, information needs, information demands,* and *information requirements* are often interchanged. Existing studies generally have similar defects. Carter summarizes the limitations of 58 selected studies. His conclusions are generally applicable to most information need studies:

1) Little or no attention was given to their relationship to other user studies.
2) Sampling was not representative of the groups being investigated.
3) Not enough detail to allow a comparison of populations.

4) No sample of questionnaire prior to its use as a measuring devise.

5) No system is in control of variables.

6) No attempt to distinguish between what a person did as opposed to what he said he did.

7) Auerbach Corporation states that studies can be criticized not only on the internal data developed, but for *lack of any valid method to relate data between different studies.* Different, ill-defined, non-existent units in each study . . . no method to correlate, or cross-tabulate data developed or can be developed.

8) No attempt was made to define the type of user in the sciences -- no studies of aeronautical, mechanical etc., engineers . . . .

Despite the increasing sophistication and number of user studies, "the need of the user is still not well enough known to permit one to completely formulate a design for an information system which will serve him."[7]

FOOTNOTES: Critique of Use and User Studies

[1]Bernard Berelson, *The Library's Public* (New York: Columbia University Press, 1949); Herbert Menzel, *Review of Studies in the Flow of Information among Scientists* (New York: Columbia University, Bureau of Applied Social Research, 1960); Richard A. Davis and Catherine A. Bailey, *A Bibliography of Use Studies* (Philadelphia: Drexel Institute of Technology Graduate School of Library Science, 1964); William J. Paisley, *The Flow of (Behavioral) Science Information; a Review of the Research Literature* (Stanford, California: Stanford University, Institute for Communication Research, 1965); and David N. Wood, "User Studies: A Review of the Literature for 1966-1970." *Aslib Proceedings*, XXIII (January, 1971), 11-23; Marcia J. Bates, *User Studies: A Review for Librarians and Information Scientists* (Washington, D.C.: U.S. Dept. of Health, Education and Welfare, Office of Education, March, 1971).

[2]See Herbert Menzel, *Review of Studies in the Flow of Information among Scientists* (New York: Columbia University, Bureau of Applied Social Research, 1960); Saul and Mary Herner," Information Needs and Uses in Science and Technology," *Annual Review of Information Science and Technology*, Vol. II (Chicago: Encyclopedia Britannica, 1967), pp. 1-33; William Paisley, "Information Needs and Uses," *Annual Review of Information Science and Technology*, III (Chicago: Encyclopedia Britannica, 1969), pp. 1-30; Thomas J. Allen, "Information Needs and Uses," *Annual Review of Information Science and Technology*, IV (Chicago: Encyclopedia Britannica, 1969), 3-30; Ben-Ami Lipetz, "Information Needs and Uses," *Annual Review of Information Science*, V (Chicago: Encyclopedia Britannica, 170), pp. 3-32; Diana Crane, "Information Needs and Uses," *Annual Review of Information Science and Technology*, VI (Chicago: Encyclopedia Britannica, 1971), 3-40; Nan Lin and William D. Garvey, "Information Needs and Uses," *Annual Review of Information Science and Technology*, VII (Chicago: Encyclopedia Britannica, 1972), 5-37.

[3]Herbert Menzel, "The Information Needs of Current Scientific Research,"*Library Quarterly*, XXXIV (1964), pp. 4-19; Herbert Menzel,

FOOTNOTES: Critique of Use and User Studies (cont'd)

"Planned and Unplanned Scientific Communication," *Preprints of Papers for the International Conference on Scientific Information* (Washington, D.C.: National Academy of Sciences, National Research Council, 1959), pp. 190-223; Edwin B. Parker and William Paisley, "Research for Psychologists at the Interface of the Scientist and his Information System," *Introduction to Information Science*, edited by Tefco Saracevic (New York: Bowker, 1970), pp. 85-93; William Paisley, *The Flow of (Behavioral) Science Information; a Review of the Research Literature* (Stanford, California: Stanford University, Institute for Communication Research, 1965).

[4]Marcia Bates, *User Studies: A Review for Librarians and Information Scientists* (Washington, D.C.: U.S. Dept. of Health, Education and Welfare, Office of Education, March, 1971).

[5]Herbert Menzel, *Review of Studies in the Flow of Information among Scientists* (New York: Columbia University, Bureau of Applied Social Research, 1960).

[6]Eurgen E. Wall, "A Rationale for Attacking Information Problems," *American Documentation.* XVIII (1963), pp. 97-103.

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EPILOGUE -- NEXT STEPS

Although this report has identified some populations and subject areas for which information needs have been studied, the needs of other populations, for instance, humanities, are yet to be identified and investigated. Of those groups already studied, information gathering habits and sources used to satisfy needs have been fairly well covered. Further investigation is needed into the *nature, form,* and *substance* of information needs. The patterns of research development and characteristics peculiar to each discipline must be better understood in order to predict needs within disciplines.

The methodology of information needs studies is being refined. Standard protocols, however, must be developed to compare the needs of different populations. In the future, further replication studies should be executed before findings can be considered accurate.

Information needs cannot be studied in a vacuum; environmental factors affecting these needs must be identified and measured before needs can be understood or predicted. It has not been possible within the scope of this study to consider other factors related to and affecting information needs, namely: information use, some aspects of information transfer, and the availability and economics of information. Examining the use of information could, for instance, clarify the types and forms of information needed for different purposes. In the area of information transfer, further research is needed on the human capacity to absorb and process information, and about the criteria used by an inquirer to make relevant judgements. The relationship of *gatekeepers* and *invisible colleges* to quality production is a rich subject for investigation. The economic factors underlying the structure of supply and demand for information require further research. The value of specific information, the costs of supplying it, and the value of return for the information supplied should be measured in dollars. The accessibility, availability of information, and the form

of its dissemination also need additional investigation. The most inexpensive and effective methods of production and distribution should be determined.

Finally, these additional observations were made by the staff. It seemed that if libraries are going to retain (or regain?) a place in providing information services to all segments of society, more research into citizens' needs must be directly conducted or sponsored by libraries themselves. This will require the development of expertise in research methods focusing on individual needs.

Also, it may not be enough to research the library users or specifically information needs, but rather to investigate a variety of populations -- whether or not they are users -- periodically. We will then have a more accurate idea of what needs are in general, without particular regard for the place of *information* in their lives.

A full-blown theory of information must be developed which includes not just that information actively sought to solve a problem or to make a decision, but also that information which is passively acquired and for which we may have no present use. Such a theory does not exist at this time.

APPENDIX A:

A selected listing of sample questionnaires and instruments used to determine information needs.

EDUCATION:

ED.1: Information Needs of Vocation-Technical Educators. Questionnaire.

ED.2: Information Needs of Elementary, Secondary, Vocational, and Community College Educators. Questionnaire.

ED.3: Information Needs of Teachers. Questionnaire.

ED.4: Information Needs in Education at all Levels. Questionnaire.

ED.5: Information Needs of College of Education Lecturers. Interview Guide.

ED.6: The Decision Process and Information Needs in Education. Questionnaire.

ED.7: Information Needs and Use in Innovative Programs in Higher Education. Questionnaire.

GENERAL PUBLIC:

GP.1: Information Needs of the General Public -- Baltimore. Interview Guide.

GP.2: Attitudes, Media Use, Information Needs of the General Public -- Syracuse. Interview Guide.

GP.3: Information Sources of the General Public. Interview Guide.

GP.4: Patterns of Adult Information Seeking. Interview Guide.

GP.5: Information Usage, Beliefs, Attitudes, and Exposure to the Mass Media. Interview Guide for Organizations.

GP.6: Information Usage, Beliefs, Attitudes, and Exposure to the Mass Media. Interview Guide for Organizations, and Interview Guide for Households.

PLANNING:

PL.1: Information Needs of Planners. Questionnaire.

PSYCHOLOGISTS:

PS.1: Convention Attendants and their Use of the Convention as a Source of Scientific Information. Questionnaire.

PS.2: The Use of Scientific Journals by Psychologists and the Readership of Current Journal Articles. Questionnaire.

PS.3: Information Exchange Activities of Foreign Psychologists and A Comparison of Such Activities with those Occuring in the United States. Questionnaire and Interview Guide.

PS.4: Scientific Information Exchange among Psychologists in Two Research Environments: Academic Settings and Government Laboratories. Questionnaire.

PS.5: The Use of Books as a Medium for the Dissemination of Scientific Information. Questionnaire.

PS.6: *Psychological Abstracts:* Their Function in Information Transfer. Questionnaire.

PS.7: Scientific Information Exchange and Interaction at the International Congress of Psychology. Questionnaire.

PS.8: Communication in Psychology: Paper Requestor Questionnaire, Convention Attendant Questionnaire, and Immediate Reader Questionnaire.

PS.9: The Use of Information in the Undergraduate Teaching of Psychology. Questionnaire.

PS.10: Information Exchange at the American Psychological Association Annual Convention and the Function of the Convention *Proceedings* in Such Exchange. Questionnaires: Author Questionnaires, Requestor Questionnaire, Attendant Questionnaire.

PS.11: Information Exchange Activities Involved in Psychological Work. Questionnaire.

PS.12: Networks of Informal Communication among Productive Psychologists. Questionnaire.

SOCIAL WORK:

SW.1: Information Needs of Social Workers. Questionnaires.

SCIENCE AND TECHNOLOGY:

ST.1: Information Needs of Scientists and Technologists with the Department of Defense. Interview Guide.

ST.2: Information Needs of Technical Information Users in a Medium-sized Organization. Interview Guide.

ST.3: Information Needs of Mechanical Engineers. Questionnaire.

ST.4: Information Needs of Physicists and Chemists. Questionnaire.

ST.5: Information Diffusion Among Medical Practitioners. Questionnaire.

ST.6: Information Transfer Practices of Scientist and Technologists in Industrial Organizations. Questionnaire.

ST.7: Planned and Unplanned Scientific Communication among Chemists, Biochemists, Zoology Faculty. Interview Guide.

ST.8: Literature and Reference Needs of Scandinavian Scientists and Engineers in Research and Development. Questionnaire.

ST.9: Information and Literature Use in a Research and Development Organization. Questionnaire.

ST.10: Information Demands of Technical Library Users. Questionnaire.

ST.11: Information Practices of Medical Practitioners. Questionnaire.

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